

POPULAR Computing WEEKLY

35p

23-29 June 1983 Vol 2 No 24

This Week

Spectrum software

Tony Bridge reviews another selection of Spectrum games in his own inimitable style, including *Jetpac*, *Ah Diddums* and *Knot in 3D*. See page 14.

Programming

Bob Skinner looks at the advantages of using two-dimensional string arrays when constructing programs. See page 17.

Memory map

Ian Logan explores the intricacies of the Spectrum memory map in the first of a new five-part series starting on page 24.

New releases

Exciting new games for Spectrum, BBC, Vic20 and Dragon 32 including *Jumping Jack* from Imagine, *Starship Enterprise* from Silversoft and *Droids* from J Morrison (Micros). See page 45.

News Desk



Major break-through for Adam

THE Colecovision Adam computer announced at the Consumer Electronics Show in Chicago a fortnight ago has been hailed as a major breakthrough in both pricing and performance.

The Adam, with a specification typical of machines costing four times its \$600 (around £400) price tag, comes as a complete system including the memory and processor module, a separate keyboard and the SmartWriter printer.

The memory module is the

Z80A-based processing heart of the Adam with 80K Ram, one built-in stringy micro-floppy drive, a Rom cartridge slot capable of accepting the full range of existing Colecovision games cartridges and four additional expansion slots. Screen output features 36 colours with a 32 sprite capability, and the Adam has three sound channels.

The keyboard is a separate unit with 75 full-travel keys.

The SmartWriter is a letter

Continued on page 5

Earl's Court fair a let-down

DESPITE the increased size of the 1983 Earls Court Computer Fair — with over 135 exhibitors — the event was a disappointment.

Many of the new products shown at the Commodore Show the week before — like the SX64 portable computer and the Commodore 64 Speech Synthesiser — failed even to make the mile-long journey.

Texas and Atari failed to exhibit any new hardware, and Acorn decided to hold off any new advances until its own show in August.

In what was perhaps the biggest disappointment of all, Sinclair Research had no surprises to unveil. Not even any non-surprises — such as a micro-drive.

So it was left to the smaller manufacturers to provide the interest. Two new computers were on display for the first time — the Memotech MTX500 machine and the

Continued on page 5

Classified

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer.
Ring 01-930 3266 and give us the details.

Classified

TEXAS TI 99/4A CASSETTE LEADS £4.95

INCLUDING POST
AND PACKING
Single Recorder only
Orders to: (Dept. PCW)
Clares, 222 Townfields Road,
Winsted, Cheshire CW7 4AX
Tel: Winsted 51374



Classified

BBC, ORIC, LYNX CASSETTE LEADS WITH MOTOR CONTROL ON to DIN or DIN to JACKS

£2.95
Orders to: (Dept. PCW)
Clares, 222 Townfields Road,
Winsted, Cheshire CW7 4AX
Tel: Winsted 51374



Classified

DRAGON 32/TANDY COLOR Now 4 — yes 4 — fabulous magazines just for you!! "RAINBOW" "COLOR COMPUTER NEWS" "COLOR COMPUTER MAGAZINE" "HOT CO-OP"

all plus EXCLUSIVE UK European Supplement
and free advisory service. Send £2.95 (+5p)
S&P for sample copy to ELKAN ELECTRO-
NICS (Dept. POP), FREEPOST, 11 Bury New
Road, Prestwich, Manchester M25 6LZ. Tel
061-788 7813

ZX81 SOFTWARE FOR SALE. Over 40 cassettes, including *Piranha*, *Vu*, *Calc*, *Forth*, *Krazy-Kong*, *Vu*, *File*, *Chess*, *Adultery*, *Sabotage*. All 40 for £95 (or split them up). Ritchi, 7 Victoria Buildings, Lower Bristol Road, Bath, BA2 3EH.

BBC ADVENTURE. Sword of destiny for BBC Model B microcomputer. Full 32K, over 100 locations. Can you crack the cryptic clues? Maim the marauding monsters. Only £6.99, from Paul Furie, 50 Malvern Avenue, Bexleyheath, Kent.

SIX 16K ZX81 MACHINE CODE GAMES. Fantastic value, over 70K on quality cassettes. *Centipede*, *Haunted House*, *Berserk*, *Nasties*, *Kong*. Kermit plus introduction. £5 to N. Sheard, 2 Ashbrook Drive, Prestbury, Cheshire SK10 4BY.

JUPITER ACE USERS. Eight new games programs for only £1 plus SAE to: Inkapaki Software, 17 Patrick Street, Grimsby, South Humberside DN32 0JQ.

Continued on page 40



WANTED! PROGRAMMERS WITH IDEAS!

Artic Computing, the makers of Gobbleman, Galaxians, Ship of Doom, Combat Zone, Voice Chess and many other bestselling home computer games are looking for programmers with bright ideas!

Have you got the game of the decade locked away inside your head?

Could you invent another Pac-Man? Or the 1980's answer to Space Invaders?

If you can devise new games and write them into workable

programs for a wide range of home computers then you could be the person we're looking for.

\$\$\$\$\$\$ for Programs!

Artic will purchase your new programs as well as guarantee high royalties on all subsequent sales. If the game you devise is even moderately successful this could mean considerable earnings for you.

Unlimited technical support!

If we think your ideas have

potential we will provide you with full technical support — all the hardware you need, assistance with program development and advice on how to create even more popular programmes.

All negotiations in strictest confidence. Please write to Managing Director.

**Artic Computing Limited,
396 James Reckitt Avenue,
Hull, North Humberside,
HU8 0JA.**

The Team

Editor

Brendon Gore

News Editor

David Kelly [01-930 3271]

Software Editor

Graham Taylor [01-839 2504]

Production Editor

Lynne Constable

Editorial Secretary

Caroline Owen

Advertisement Manager

David Lake [01-839 2846]

Advertisement Executive

Alastair Macintosh [01-930 3260]

Classified Executive

Diane Davis [01-839 2476]

Administration

Theresa Lacy [01-930 3266]

Managing Editor

Duncan Scot

Publishing Director

Jenny Ireland

Popular Computing Weekly

Hobhouse Court, 19 Whitcomb Street,

London WC2 7HF

Telephone: 01-839 6835

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by

Chesham Press, Chesham, Bucks

Distributed by S M Distribution

London SW9. 01-274 8611. Telex: 261643

© Sunshine Publications Ltd 1983

Subscriptions

You can have *Popular Computing Weekly* sent to your home:

UK Addresses

26 issues £9.98

52 issues £19.95

Overseas Addresses

26 issues £18.70

52 issues £37.40

How to submit articles

Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

News

5

Memotech MTX500

Letters

7

Prompt service

Star Game

10

Fun Fair for 16K Spectrum

Street Life

13

Artic programmer John Ritman

Reviews

14

Spectrum software

Programming

17

Bob Skinner looks at string arrays



Dragon

20

Recording sound

Spectrum

25

Ian Logan explains the memory map

BBC in education

27

Arithmetic into assembly language

Open Forum

29

Five pages of your programs

Adventure

37

Tony Bridge's corner

Peek and poke

39

Your questions answered

New releases

45

Latest software programs

Competitions

47

Puzzle, Top 10, Ziggurat

Editorial

The second annual Computer Fair, which was held at Earls Court last week, was more notable for its absences than for its participants. There was no Electron and, despite rumours to the contrary, no microdrive.

The microdrive was first announced at last year's Computer Fair — more than 14 months ago — with the immortal phrase "coming soon". Despite intense pressure from aggrieved Spectrum owners, and the appearance of a microdrive case at one computer show, it is still "coming soon". Indeed, the recent Sinclair advertisements have omitted to mention the microdrive at all.

Provided the microdrive lives up to its specifications — storage of up to 100K, transfer rate of 16K a second and an access time of 3.5 seconds — it is still likely to prove extremely popular. But, if the microdrive does not appear soon, Sinclair may yet find the Japanese have beaten him to it.

The other notable absentee from this year's Computer Fair, the Electron, is likely to appear at the Acorn User exhibition in August. While this is not quite as late as the microdrive, it is still a long time in a market that is becoming increasingly competitive.

All in all, the Computer Fair this year has been fairly subdued, compared to last year's extravaganza which coincided with the launch of the Spectrum.

Next Thursday

Play next week's star game, *Satellite Docking* for the 16K Spectrum, and see if you can manoeuvre your space shuttle to match the spin of the satellite in order to dock and refurbish it.

Subscribe to Popular Computing Weekly

I would like to subscribe to *Popular Computing Weekly*.

Please start my subscription from the issue.

UK Addresses: ☐ 26 issues at £9.98 ☐ 52 issues at £19.95

Overseas Addresses: ☐ 26 issues at £18.70 ☐ 52 issues at £37.40

Please tick relevant box

☐ I enclose my cheque to *Popular Computing Weekly* for

Name

Address

Please send this form, and cheque, to *Popular Computing Weekly*, Subscription Dept., Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Adam Colecovision

Continued from page 1

quality daisy-wheel 80-column printer based on the Smith-Corona TP-1 printer which comes complete with a Smart-Writer word processing software package built into Rom.

Adam's Basic is compatible with Applesoft and the machine comes complete with an arcade game — *Buck Rogers Planet of Zoom* — and a pair of joystick controllers.

Expansion options for the Adam include a 64K Ram pack, a further 500K storage drive, an expansion module making the Adam able to accept the full range of Atari VCS cartridges, and a further module giving the Adam CP/M compatibility.

Software for the Adam, apart from Coleco's own Rom games developed for the Colecovision will include Logo, SmartBasic (a simplified Basic for young children) and a range of home management systems.

The \$600 Adam computer system can be achieved in two ways: either by buying the memory module, keyboard and printer outright or by first buying a Colecovision video games console and then adding what is called the Expansion module three, comprising the memory storage unit, keyboard and printer. Either way the result is the same — a complete system for around £400. In the US the price of the games console is \$170 and the price of the expansion computer will be around \$430.

The Colecovision games console has now gone on sale in this country, price £149. The add-on computer/keyboard/printer Adam system, and the all-in-one Adam system are both expected in the late autumn.

Computer fair

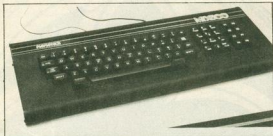
Continued from page 1

Video Technology Laser 200. Computers showed its 96K version of the Lynx, together with a redesigned Alps disc drive, Centronics printer interface and joystick interface.

Dragon Data showed a prototype of its disc drive, a single half-height 5¼-inch system with a formatted capacity of just over 184K.

Jupiter Cantab slashed the price of its Forth 3K Ace to

Memotech emphasis is on expansion



MEMOTECH'S new MTX500 computer, launched at the Earl's Court Fair, places the emphasis firmly on flexibility and expansion.

The basic machine, costing £275, can be expanded more or less indefinitely to a system costing over £45,000.

The starter MTX500 is Z80A-based with 16K Rom, 32K user-Ram and 16K video-Ram. Rom includes MTX Basic with a built-in Z80 Assembler/Disassembler. Display is 16 colours with 40 columns and a 256 × 192 16-colour high-resolution graphics mode. There is a Sprite capability and eight independent virtual screens. A 3-channel sound synthesiser is built-in. The professional-style keyboard features separate numeric and function pads. Outputs include twin joystick, cassette, Centronics, tv, monitor, hi-fi and twin RS232 ports. There is also a Rom cartridge slot and a further, uncommitted I/O port. Expansion options include user-Ram

expandable to 512K, an 80-column card, 5¼-inch and 8-inch floppy discs, Winchester hard discs and up to eight 256K or 1M 'silicon' discs. CPM will be available. An 8-station 'Oxford-Ring' networking system is being developed and a 16-bit add-on processor is in the pipeline. Then, if desired, keeping all the peripherals, the MTX500 unit can be replaced by Memotech's up-market machine, the Orchid SM1.

All of which makes the MTX500 a machine that can grow from a home micro up to a complete business system.

Software for the MTX500 consists so far of a range of arcade games but more serious packages — word processing, accounting, filehandling — will follow. Other languages include a variant of Logo supplied as standard and Pascal available soon on Rom.

The MTX500 machine should be in the shops in the late Autumn, with the Orchid SM1 to follow early in 1984.

Sinclair option on De Lorean

CLIVE Sinclair has purchased an option on the De Lorean sports car factory in Northern Ireland.

Sinclair, who has been de-

veloping an electric car in Winchester, hopes to use the site as an assembly plant. The Dunmurray-based factory possesses one of the most advanced plastic moulding systems in Europe.

Talks between Sinclair and the Northern Ireland Industrial Development Board have been in progress since February. Details of the plan have not been released, but a Sinclair spokesman confirmed that "Sir Clive has purchased an option to acquire a major portion of the assets of the De Lorean plant from the joint receivers".

The first prototype from the Sinclair Vehicle Project is not expected to be unveiled before

1985. However, it is no secret that Sinclair has been working on advanced battery technology with a view to developing the world's first mass-produced electric car.

The Sinclair Vehicle Project is wholly owned by Sir Clive and the De Lorean deal will be financed by Sir Clive personally, not by Sinclair Research, his highly successful computer division.

Laser has coherent approach

THE latest micro to lay claim to be the cheapest colour computer is the Laser 200, manufactured by the Hong Kong company Video Technology and now being imported to this country.

At £69.95 the machine offers a Z80A processor with 16K Microsoft Basic, 4K Ram (expandable to 68K), nine colours, one sound channel and a Spectrum-like keyboard. Display is 32 × 16 characters with two graphics modes — 64 × 32 with a colour resolution of 2 × 2 pixels and a high-resolution mode of 128 × 64 with a choice of two sets of one background and four foreground colours.

The Laser features cassette port, tv output, monitor output, expansion and peripheral ports. There is an optional single-keyword entry facility.

The Laser 200 will be available in July. A 16K Ram expansion unit should be available at the same time, for £29.95. August should see joysticks (£19.95 pair) and a Centronics interface (£19.95). A four-colour printer (£149.95) and 64K Ram pack (£59.95) should follow in the autumn.



A range of games, educational and utility software will be available at launch — some 18 titles — with a further 17 titles at the end of the summer. All are on cassette priced at £3.95 (4K) and £4.95 (16K). Some UK software houses are also working on material including Abbox and Protek.

1985. However, it is no secret that Sinclair has been working on advanced battery technology with a view to developing the world's first mass-produced electric car.

The Sinclair Vehicle Project is wholly owned by Sir Clive and the De Lorean deal will be financed by Sir Clive personally, not by Sinclair Research, his highly successful computer division.

WINDOW ON ANOTHER WORLD

NEW RELEASES

STAR JAMMER — Wiping the sweat from my brow, I searched the inky blackness, ahead for signs of enemy fighters. Through Star Jammer was the best ship in the galaxy, my dwindling energy reserves made me doubt I could reach the next stargate... (a one-player space arcade game requiring one joystick).

SUPER SKILL HANGMAN Hangman as you've never played it before! A vocabulary of over 1,000 words, three levels of difficulty and an optional timer make this classic word game a challenge for kids of all ages.

NIGHTLIGHT — An accurate simulation of flying a single engine light aircraft. Nightlight allows for take-off, landing and aerial manoeuvres including loops and rolls.

SALAMANDER GRAPHICS SYSTEM — A comprehensive picture drawing system for the home computer enthusiast. Pictures in any mode or colour set, text on the hi-res screens and storage of pictures on tape. Requires one joystick.

ORIC TREK — A version of our classic Dragon Trek for the Oric-1! Ten levels of difficulty, three sizes of galaxy and more features than you can shake a Klingon at. A must for all Oric owners!

ORIC GAMES COMPENDIUM — Four exciting games for the whole family: Donkey Derby, Kingdom, Viper and Space Station.

DRAGON 32 and TANDY 32K (please specify):

Dragon Trek £9.95 Wizard War £7.95,
Golf £7.95, Grand Prix £7.95, Vulcan
Noughts & Crosses £7.95, Games Comp
D1 £7.95, Salamander Graphics System
£9.95, Super Skill Hangman £7.95, Star
Jammer £7.95, Nightlight £7.95.

BBC MODEL B:

Dragon Rider £7.95, Tanks! £7.95, Games
Comp B1 £6.95, Games Comp B3 £6.95,
EDG Graphics (tape) £24.95, EDG Graphics
(disc) £29.95
ORIC 1: Oric Trek £9.95, Games Comp 01
£7.95.

NOW AVAILABLE AT MAJOR BRANCHES OF:



AND



Mail Order (add 50p p&p) and Catalogues (send SAE) from:
Dept C, SALAMANDER SOFTWARE, 27 Ditching Rise, Brighton,
East Sussex BN1 4QL. Tel: 0273 771942

Salamander Software

LETTERS

A small bug!

Congratulations and "thank you" to Paul Selin for the fine adventure program for the Spectrum, published over the last three weeks.

Unfortunately, I'm afraid a small bug has crept into it, resulting in the map not being entirely accurate. The problem lies in the figure "10" at the bottom of the left-hand side of the map. Like the other figures, this has a space printed after it, and in the case of "10" this results in the main line of the map being printed one space too far to the right.

I suggest the following corrections to line 9220 (I refer entirely to program line 9220, and to the lines within it as printed):

On line 2, put a space near the end, before 12 ("12")

On line 4, add the space between the quotes

On line 4, add AT h - 1:B

On line 6, change x + 6 into x + 7

Once again, thanks for a fascinating program and thanks, too, for an excellent magazine.

Michael Kirkland
20 Batey Avenue
Rainhill
Prescot
Merseyside L35 8LT

Prompt and polite

I had a 16K ZX Spectrum I and I decided to upgrade it to 48K. I looked in all the computer magazines that I read, and saw an upgrade in the classified advertisements at the back of your magazine that I thought offered good value.

I sent off the money for the upgrade kit and four days later, it arrived. I got someone I know who repairs computers to install it for me. Unfortunately, the extra memory did not work. He gave the kit back to me and told me to return it and get a replacement.

I sent off a letter with the chips, explaining the situation. Four days later, I received the replacements, and a letter of apology. The letter also said that the original chips were being tested and, if they were found to be faulty, they would

refund postage. They also said that if the chips that were sent as replacements were faulty, I was to send off the machine, with the chips, and they would insert them without any extra cost, as they normally do. The replacements did not work properly, so I packed the Spectrum in its box, and sent it back with the chips and another letter.

Seven days later, I got it back through the post with a letter explaining that although the chips were tested, and found to be in perfect working order, the sockets in the computer to receive them didn't work. They sent back the sockets and, even though they did not usually do repairs, they fitted the chips at no extra cost, directly on to the circuit board. I was told that they hoped that this would in no way prevent me from doing business with them in future.

I would like to thank J C Brewer and the company's representative who sent the letter for prompt, polite service. Also, I would like to say that I will certainly turn to them in future if need be, as I was so impressed with their service.

Peter Mirtitsch
11 Bengain Street
Haghill
Glasgow G31 3QR

Nice to hear of a company being praised for doing something right. Congratulations to J C Brewer are in order.

Disconnected ear!

Here is a tip which your readers may find useful.

I was fed up with constantly pulling out the Ear plug on my cassette recorder when saving programs from my Spectrum, until I came up with a solution which works really well and enables both Ear and Mic plugs to be left in at all times.

I fitted a lever-operated micro switch (Subminiature SPDT lever switch from Tandy — price 89p) inside the recorder case so that it was operated when the record button was pressed. Using the two outer connections I wired it in series with the Ear socket, so that in the record mode the Ear socket is disconnected. Only the inner pin of the Ear

socket is disconnected, the outer (screened) pin does not matter.

This simple inexpensive modification has proved very effective and easy to fit and use.

Barry Ashfield
37 Cottesmore Road
Hessle
North Humberside

Threatening to leave!

Having just read your Adventure column in Vol 2 No 22 where you say "ask a friend to help" in *The Hobbit*, I feel I must ask more than this.

No doubt we all asked for help and received the reply "ask a friend" and no doubt we all decoded the clue, telling us to be carried, but all efforts to get through the window are failing.

My wife is threatening to leave, my kids are begging me to play, the car is due for a service, the house needs painting and my boss wonders why I sit staring into space.

Tracing information...

The Sinclair Spectrum needs a Trace command to print program line numbers, variables, etc, as each one is executed by the computer; a useful aid to debugging.

My method makes use of the printer, as I find that printing Trace information on the screen leads to confusion. By

Please help me get out of the Goblin's Dungeon before the Spectrum is tested for its aerodynamic qualities across our lounge!

Roger Spurr
3 Bacchus Way
Morton
Derbyshire DE4 3AG

Without giving too much away, your problem will be eased if you first open the aforementioned window.

Is it gobbledygook?

I am in the process of preparing some material relating to the uses and abuses of micro-computer manuals generally and to the crazy things they say in micro-computer manuals specifically. If any of your readers has a relevant funny story, or can point to specific instances of gobbledygook in manuals, I'd be delighted to hear from them.

Michael Thorne
Computing Mathematics Dept
Mathematics Institute
Senghennydd Road
Cardiff CF2 4AG

setting a 'switch' at the start of the program you can turn the Trace on or off.

Here is the system applied to the program on page 38 of the Spectrum Manual.

L V Phillips
17 Elizabeth Ave
Ibstock
Leicester LE6 1NG

```

1 LET TRACE=1: REM The switch
' on', to use trace. To turn off
the trace make this line
LET TRACE=0
100 LET x=10: IF trace THEN PRI
NT #3;x: REM This will give the
value of the variable.
110 GO SUB 500
120 IF TRACE THEN PRINT #3;"L12
0": PRINT S
130 LET x=x+4
140 GO SUB 500
150 IF TRACE THEN PRINT #3;"L15
0": PRINT S
160 LET x=x+2
170 GO SUB 500
180 IF TRACE THEN PRINT #3;"L18
0": PRINT S
190 STOP
500 IF TRACE THEN PRINT #3;"L50
0": LET s=0: REM The 'L' to
indicate line number rather than
variable value.
510 FOR y=1 TO x
520 LET s=s+y
530 NEXT y
540 RETURN

```

STARTECH

Absolutely
the lowest
prices!



VIC 20 16K RAM PACK £28.95

Including VAT and Postage and Packing.

Tick for further information

- ☐ VIC 20 PRODUCTS
☐ COMMODORE 64

All prices subject to
availability or change without notice

PLEASE SEND ME

VIC 20 16K RAM PACK

Qty

Price

£28.95

TOTAL

(24hr. ANSWERPHONE SERVICE)

Name

Address

I enclose Cheque, P/O for

CREDIT CARD ☐ ACCESS ☐ BARCLAY CARD ☐

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

POB.C.W.6.83

STARTECH

208 Aigburth Rd, Aigburth, Liverpool L17.051 727-7267

A NEW LOW PRICE FROM FOX ELECTRONICS SPECTRUM UPGRADES

ONLY

£21.00

INCLUSIVE (Issue 2 machines only)

A high quality kit at a new low, low price which simply plugs into existing socket within your Spectrum, no soldering is required and step by step instructions are supplied.

PROBABLY THE BEST KIT AVAILABLE AT DEFINITELY THE
LOWEST PRICE

Should you require any more information on the kit or any other items, please phone or write to us at the address below.

Also available for both the
SPECTRUM OR ZX81

The FD42 Keyboard. A keyboard to house your Spectrum/ZX81 PCB and give you a full typewriter type keyboard, no soldering or electronic knowledge required to fit.

Only £29.95 inclusive



And for the Spectrum only the Spectrum Echo, an amplifier with a tape switching interface giving you the facility to save and load without switching leads. Also incorporates a cueing facility for easy location of programs.

Only £19.99 inclusive



ZX81

A replacement keyboard — this one with a calculator-type feel. Peel off backing and press to fit. Incredibly low price of £10.00 p&p included.

ZX81

ZX81

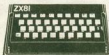
ZX81

ZX81

ZX81

ZX81

ZX81



VIC20

More memory for your VIC20
Vixen RAM Cartridge for the VIC20

Switchable between 16K or 8K + 3K.
Gives you the option of full 16K RAM or 8K and 3K RAM in one package. When added to a Standard VIC20 gives 16384 bytes of extra memory in memory blocks 1 and 2 or 3092 bytes of extra memory into the 3K memory block AND 8192 bytes of extra memory switchable between memory blocks 1 and 3.

Fully compatible with available motherboards/modules.
Simply plugs into the rear expansion port of computer.
No re-addressing of existing BASIC programs needed.



Only
£39.95
inclusive

VIC20

A high quality light pen which plugs straight into your Vic with no special interface needed. £20.00 inc. of software + p&p.



SEND NOW TO: FOX ELECTRONICS
141 ABBEY ROAD, BASINGSTOKE, HANTS.
Tel: 0256 20671.

PLEASE SEND ME:

SPECTRUM UPGRADE ☐
SPECTRUM KEYBOARD ☐
SPECTRUM ECHO ☐
ZX81 FD42 KEYBOARD ☐
ZX81 PRESS-ON KEYBOARD ☐

VIXEN RAM CARTRIDGE ☐

VIC LIGHT PEN ☐

Name

Address



Fun Fair

A new game for the 16K Spectrum by Jack Knight

Inspiration for this game comes from the fairground, from the booth where the punter pops ping-pong balls into the open mouth of a mock clown, to score on a table below.

That is the inspiration. But, with the power of the micro (in this program, the Spectrum), this simple gamble is built into a sophisticated trial of agility of fingers and quickness of eye. However, the smell of the fairground is still there — the opening includes a snatch of fairground-organ music, and the scene is the Barker's booth.

The ball has become a bubble, blown at

random from a multi-headed blower which moves irregularly up and down its column at one side of the booth. At the opposite side of the booth is the clown, face peeping from behind the curtain, his mouth open for catching. Up and down he moves trying to follow the blower, manipulated from behind the scenes by the player.

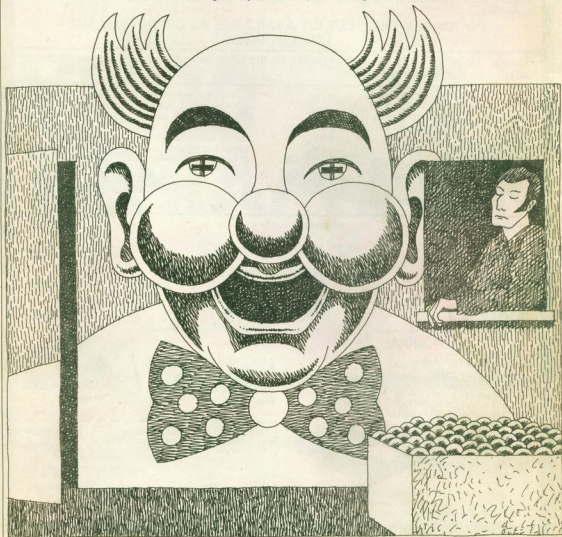
When you play, watch out for what happens when the clown does catch a bubble in his mouth. The bubble may (or may not) drift as it nears the end of its journey — just when you thought you had it in line for catching. If that were not enough, every 10 bubbles (with a tinkling

of sound, preceded by a warning beep) the multi-headed blower moves closer. Then try to keep pace with it!

For your 10p you get a generous 50 bubbles to beat the previous score.

The opening gives just enough guidance for a newcomer to play. He/she is directed to Inkey's "6" and "7" to move the clown, and is warned about bubble drift. The pause for reading is masked and enlivened by a simulation of fairground music, which also helps to create the atmosphere.

The following scene-setting section cre-



ates the booth. The left-hand margin is used for score and high-score.

In the main routine, *User* graphics create the multi-headed blower and the head of the clown. In contrast, the 0-sign makes as passable an imitation of a bubble as could be hoped for.

The appearance of variable *k* twice in the main routine may be a puzzle. Its purpose is to switch the loop from driving the blower and the clown, to blowing the

bubble across the screen whilst still continuing to allow movement of the clown's head.

In the next level section, a new blower column is made to appear, so the blower can move nearer to the clown.

Musical chords mark the closing, with more than a pinch of flash. "Another go?" is the invitation. If taken up, the player is not subjected to the opening again. Also, as CIs would lead to the tedium of a repeat

of the sets stage sub-routine, selective clearing is used, mainly by *ForNext* loops. Note, with line 750 the penultimate print is two spaces wide.

With the graphics, decimal numbers rather than binary have been used to make it easier for you to type in. The graphic of the clown's lips has been confined to one square so that the red ink can be picked up by *Atr* to establish a bubble has been caught.

2044 FOR F=USR "A" TO "E"+7

2010 READ A: POKE F,A.

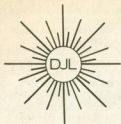
2020 NEXT F.

2050 DATA 3,7,15,31,31,31,15,5,5,15,63 20. (no 1000)

```
10 REM **FUN-FAIR** © by JACK
30 K=0
90 GO TO 2000
99 REM *BLOWER* (NB "GRAPHICS"
+E+3)
100 PRINT AT d,i;" ";AT d+1,i;"
";AT d+2,i;" ";AT d+3,i;" ";AT
d+4,i;"
110 LET C=INT (RND*7): LET f=IN
T (RND*3)
120 IF d=15 OR d=3 OR C=5 THEN
LET dd=-dd
130 LET d=d+dd
140 IF C=6 AND f=1 THEN LET l=d
-dd+9: GO TO 270
150 REM *CLOWN* (NB "GRAPHICS"
+ B,C,D)
210 LET a=a+(INKEY$="6" AND a<
14)-(INKEY$="7" AND a>2)
220 PRINT ; INK 7;AT a,30;" ";A
T a+1,30;" ";AT a+2,30;" ";IN
K 7;AT a+3,30;" ";IN K 7;AT a+4,30
230
250 REM *BUBBLE*
270 IF e=29 THEN GO TO 400
280 IF l=18 OR l=4 THEN LET b=0
290 IF e=25 THEN PRINT AT l,e;"
"; LET l=l+b
300 LET k=1
310 PRINT ; INK 7;AT l,e;" 0"
320 LET e=e+1
330 GO TO 310
390 REM *BURST OR GULPED*
400 IF ATTR (l,e+1)=10 THEN PRI
NT ; INK 7;AT l,e;" 0"; BEEP .1
30: PRINT ; INK 2;AT l,e+1;" J"
LET s=s+5: INK 2;AT 12,15
410 IF ATTR (l,e+1)<10 THEN BE
EP .1-.20: PRINT AT l,e;"
420 LET j=j+1
430 IF j=10 OR j=20 OR j=30 OR
j=40 THEN GO TO 500
435 IF j=50 THEN GO TO 600
440 GO TO 310
490 REM *NEXT LEVEL*
500 PRINT AT d,i;" ";AT d+1,i;"
";AT d+2,i;" ";AT d+3,i;" ";AT
d+4,i;"
505 BEEP .5,0
510 LET i=i+3
515 FOR n=1 TO 20: PRINT AT n,i
;" "; BEEP .01,10+n: NEXT n
520 GO TO 1100
590 REM *CLOSING*
600 BEEP .5,0
610 FOR n=1 TO 3: FOR p=5 TO 1
STEP -1: BORDER p: BEEP .1,10+p:
BEEP .1,10-p: NEXT p: NEXT n
690 REM *NEW GAME*
700 PRINT ; INVERSE 1: FLASH 1;
AT 3,10;"ANOTHER GO SIR,MADAM?";
```

```
AT 6,14; INVERSE 0: FLASH 0;"PRE
55"ENTER""
710 IF INKEY$=CHR$ 13 THEN GO T
O 730
720 GO TO 710
730 IF S=B THEN LET B=S: PRINT
AT 7,1;B
740 PRINT AT 12,1;" "
750 FOR n=1 TO 20: PRINT AT n,1
2;" ";AT n,15;" ";AT n,18;" ";AT
n,21;" ";AT n,30;" "; NEXT n
760 FOR n=10 TO 30: PRINT AT 3,
n;" ";AT 6,n;" "; NEXT n
770 GO TO 1000
999 REM *ASSIGNS VARIABLES*
1000 LET dd=1
1050 LET d=0
1060 LET s=1
1070 LET i=10
1080 LET j=0
1090 LET g=INT (RND*3+1)
1100 LET e=i+1
1120 LET b=INT (RND*3+1)
1140 IF b=2 THEN LET b=1
1500 IF b=3 THEN LET b=0
1600 LET k=0
1700 GO TO 100
1999 REM *GRAPHICS*
2000 FOR n=1 TO 5
2100 READ a$
2200 FOR p=3 TO 7
2300 READ q: POKE USR a$+p,q
2400 NEXT p
2500 NEXT n
2600 DATA "A",3,7,15,31,31,31,15
,"B",5,15,63,127,127,63,15,15,1
,"C",31,31,3,3,3,3,31,31,"D",15,1
,"E",7,7,0,0,0,"F",63,126,252,252
255,252,126,63
2999 REM *OPENING*
3000 BORDER 1: INK 6: PAPER 1: C
LS
3100 PRINT ; INVERSE 1;AT 2,8;"*
**FUN-FAIR**"; INVERSE 0;"TAB
1:"CATCH BUBBLE IN CLOWN'S MOUT
H"; TAB 6;"BY USING "6" OR "7
"*****TAB 3;"BEWARE - BUBBLE MA
Y DRIFT!"
3200 LET r=10: FOR n=1 TO 3: BEE
P 4,1: BEEP .2,r: PAUSE r: BEEP
.2,r: PAUSE r: BEEP .4,-4: BEEP
.2,5: PAUSE r: BEEP .2,5: PAUSE
r: NEXT n
3300 CLS
3999 REM *SETS STAGE*
4000 PRINT AT 4,0;"HIGH";AT 5,0;
"SCORE";AT 10,0;"SCORE"
4100 FOR n=9 TO 31: PRINT AT 0,n
;"4";AT 21,n;" "; NEXT n
4200 FOR n=1 TO 0: PRINT AT n,9
;" ";AT n,31;"M"; NEXT n
4300 GO TO 1000
```

2000 LET CA=USR "A"
2100.



DJL SOFTWARE

DEPT PCWK2, 9 TWEED CLOSE, SWINDON, WILTS
SN2 3PU Tel: (0793) 724317 Trade enquiries welcome
Export Orders: Please add £1.00 per tape airmail



ZUCKMAN ZX81 (16K)

- *ALL MACHINE CODE (10K)
- *FOUR INDEPENDENT GHOSTS
- *HIGH-SCORE 'HALL OF FAME'
- *AUTHENTIC ARCADE ACTION
- *TITLE/DISPLAY MODE
- ONLY £5.95 INC. P&P



FROGGY ZX81 (16K)

- *MOVING CARS, LOGS, TURTLES
- *ALLIGATORS, DIVING TURTLES
- *FOUR 'SCREENS' OF ACTION
- *ALL ARCADE FEATURES
- *ENTIRELY MACHINE CODE
- ONLY £5.95 INC. P&P

★ ZX Spectrum ^{New} New FROGGY 16K or 48K ★

SPECTRUM VERSION OF ARCADE GAME WITH FULL ARCADE FEATURES:—

- *Fabulous Hi-Res Colour Graphics
- *Authentic Sound Effects - 3 Tunes
- *3 D Logs, Swimming & Diving Turtles
- *3 Lanes of Multi-coloured vehicles
- *On-screen Score, Hi-Score, Time-bar
- *Snake, Alligators and Baby Frog
- *Top 5 High-Score initials table
- *Demonstration Game routine

Your home sick frog must leap across a busy main road, then onto logs and turtles in the river to reach safety of the river-bank frog homes.

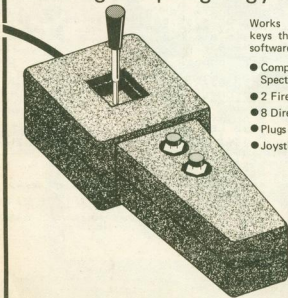
THIS MACHINE CODE GAME MUST BE SEEN TO BE BELIEVED!!

ONLY £5.95 INC. P&P



At last! A joystick that works!

Cambridge Computing bring you the first **intelligent** joystick.



Works on all existing software — regardless of which keys the program uses. No need for specially written software. Features include:

- Compatible with:
Spectrum, ZX81, Jupiter Ace
- 2 Fire buttons
- 8 Directions
- Plugs into edge connector
- Joystick and Interface £26.00

Name

Address

Please send me.....joysticks @ £26.00 for the
Spectrum ☐ ZX81 ☐ Jupiter Ace ☐

Cheques and P.O.s made payable to:

Cambridge Computing,
1 Benson Street, Cambridge CB4 3QJ.

Dealer enquiries welcome please ring C P Lloyd on
Cambridge (0223) 522905

Life in the fast lane

David Kelly talks to John Ritman, author of *Artic's 3D Combat Zone*

Step inside any arcade these days and you will see things have come a long way since the first Pong tennis game.

A major preoccupation now is simulations of 3-dimensional effects — perspective changes, panning landscapes, all in full colour and sound. Look at Atari's recent *Pole Position Grand Prix* race game or the *Zaxxon* space race.

For home-computer programmers, intent on recreating the thrills of the coin-ops in your own home, these simulations present an enormous challenge.

3D Combat Zone by John Ritman of Artic, is a recent attempt to produce true 3D effects on the Spectrum. You are in command of a tank, looking forward through the tank windows out onto the battle field. You can move forward, backward, left and right — and as you move, the landscape grows or recedes.

This kind of interactive 3D graphics has never been achieved before on one of the low-cost micros. The quality of representation and detail are limited by the Spectrum and the landscape and tanks are represented by simple line shapes.

The reason is simple — how do you make the Spectrum fast enough to draw at the sort of speed needed for a challenging real-time simulation?

John is a 26-year-old who failed maths 'O' level twice. After becoming a field tv engineer, he became interested in computers when his company began to look at the possibility of renting out micros with tvs. He thought he ought to know a bit about it and in January 1982 he bought a ZX81. A week later he bought a Ram pack and, three months on, he had taught himself machine-code. "I couldn't stop playing with the ZX81," he explains.

John actually reckons that machine-code is easier to learn than Basic: "In machine code there are only a very limited number of functions and it is easy to understand each in completeness."

The first program that John wrote was *Namir Raiders* — a multiple-wave Space Invaders game for the ZX81. In May last year he sent it in to Artic and rather to his surprise he was rung up by Artic's Richard Turner who accepted it. At the same time

Richard Turner suggested that John should write for the Spectrum, which had been launched the previous month.

To begin with, John found the Spectrum difficult to work with. Programming on the ZX81 he had found an assembler to be an essential tool — and there wasn't one at the time available for the Spectrum.

An assembler offers a sort of half-way house between a high level language like Basic and machine-code. It has some of the understandability of Basic — it has loops and labels, for example. But the resultant code — the so-called source-code — can be easily translated or assembled into machine-code — the so-called object code.

"You have really got to write using an assembler," says John. "Keying in the code direct you get too many possible errors. It only needs one mistake in hex and you have got a crash."

Machine-code is rather like writing in Basic where there are only eight usable locations or registers.

The necessary speed

Nearly the whole of machine-code is just loading and saving commands — information is plucked from a particular memory location into one of the eight registers and then saved into a different memory location. Because the screen is memory-mapped, each point on the screen corresponds to a particular memory location and by loading and saving things can be moved on the screen.

While he was waiting for an assembler, John kicked around his idea for a 3D tank simulation game. But, when he finally got one — Artic's own — he put the 3D game aside to write *Cosmic Debris*, an *Asteroids* type game. "I knew that the biggest problem with a 3D simulation would be speed — so I experimented first with *Cosmic Debris*."

The Spectrum prints in 8×8 pixel blocks. To avoid the space craft or asteroids jumping in steps of eight pixels, John designed eight sets of characters, each one with the graphics shapes offset by one pixel from the last. Then by printing each of the eight characters in turn the illusion of smooth movement is created.

Writing *Cosmic Debris* sorted out many of the graphics techniques needed for a 3D simulation.

"The only thing I had no idea about was the maths for rotations in 3D. *Practical Computing* came out with a 4-page article on 3D plotting techniques — but it still took me about a month to boil it down to two lines of formulae!"



John then became convinced that there was no way that a 3D simulation was possible on the Spectrum because of the speed necessary. He wrote his 3D tank game in Basic first and the computer took five seconds to update the screen each time to show the new positions.

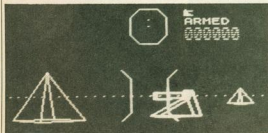
A new approach was called for. First, John created a different memory map for the Spectrum including a new, hidden, dot-programmable, high-resolution, screen. "With the finished version of *3D Combat Zone* the Spectrum really is going at full pelt. It draws each move on the hidden hi-res screen — taking about half a second — and then bulk downloads it to the main screen — what you see — in about an eighth of a second." This is how *3D Combat Zone* gets round the problem of jerky movement on the Spectrum.

"If Sinclair had incorporated a proper switchable high-resolution screen in the Spectrum in the first place it would have saved me a lot of effort," explains John.

He uses a series of algorithms to work out each new frame of the simulation. On the high-resolution screen only the minimum number of points are plotted in order to save time. These are then joined up to make the shape of the tank and the pyramids. The only positions worked out are the corners so, for example, the tank is made up of two distorted cubes involving the manipulation of only 16 points to make the tank move. The rotation is effected by the computer applying sine and cosine functions from a table to the points on the screen. Distance is achieved by dividing the up/down and left/right dimensions of a given shape by a factor which represents its distance into the screen.

So far John's 3D Tank game is the only one of its type and he is keen to stay ahead of his competitors. "The way I programmed it means that it is not as accurate as I would like. What I am working on now is a series of 3D algorithms that incorporate floating-point arithmetic. That would make any future 3D games much more accurate."

He is currently working on a game with spiralling eggs which hatch into hostile birds. He says: "Fast graphics is what I am good at and I now find programming quite easy. It is getting the idea for a good game in the first place that is difficult."



The ultimate horror!

Tony Bridge finds that there are hidden perils in being a software reviewer

Anxyth, Grand Admiral of Emperor Haile Debeus' 7th Space Fleet (Alien Contact and Subjugation): "Gentlemen, here before you is what Earthmen laughingly refer to as a 'Software Reviewer' — weird name, I grant you, but his job is to judge the effectiveness of these so-called 'games'. An innocent name for a sinister method of indoctrinating a large part of Earth's population to resist our attacks — I mean our show of friendship in the cause of cultural exchange!"

"During several centuries, the population has largely devoted its time to killing each other — now, however, a new religion appears to have sprung up. Many now worship a common blood relative, one Uncle Clive, who promises many strange and wonderful things. His followers sit and pray before what they call a Spectrum, which seems to be a wondrous artefact. [He waves a tentacle toward a blob of protoplasm] Lieutenant Snaxthpool, throw the Brain Scanner switch, let us see what this 'reviewer' has to tell us!"

Tony Bridge (for it is he!): "I won't tell you anything, you overgrown lump of ... aaaahhhh! What do you want to know, Master?"

Anxyth: "That's better, miserable being! Let us know of these 'Zapping' games — and be quick, we have no time for your ramblings."

Tony Bridge (whining): "Yes Master."

Well, the Spectrum has been with us now for only a year, yet in that time the

pyth] Humble apologies, Sire, I'll get on with it now!

First, a major disappointment in Imagine's follow-up to *Arcadia*, which will remain one of the classic Spectrum games. Whilst the graphics of *Schizoids* are astonishing, even though they are in black and white, the game mechanics unfortunately do not measure up. You are the pilot of a space refuse vessel, and are trying to shove strange alien shapes into a nearby Black Hole. The 3D graphics are, as I've said, superb, but the game has no high score facility, and only a nod towards more difficult levels. Thus any addictiveness is destroyed. I've had this game a month now, and played it twice — not good value.

If you're looking for the successor to *Arcadia*, look no further than *Black Hole*, from Quest Software (although see remarks later in this review on Imagine's other new releases). This is what many people may have expected from *Schizoids*, and is, in fact, a combination of *Schizoids* and *Arcadia*. Your starship (well, it does look like a star) has to fire across the screen (rather than up, which makes a change) at a selection of alien spaceships emanating from a Black Hole — thus making nonsense of current scientific theory (except the Walt Disney Theory of Multiple Returns!).

You have a choice of weapons — a short range, straight-firing cannon, or a

so on. Collide with one and you are spread across the Galaxy. Although a little plagiaristic, this program has beautiful graphics, and the requisite addictiveness.

The *Arcadian* is the name of the latest collection from the software house of J K Greye. This company has been looking belatedly for a new Malcolm (Mr 3D) Evans, since he left to start New Generation Software. This tape is a collection of four games, plus a menu. *Invasion* is *Invaders* of course, and *Kamikaze* is *Scramble*. *UFO* is an asteroid-avoiding game à la those early ZX81 games, while the only original one on the tape is *Minefield*. This game has you laying mines in a forest. Step on the trail you've already laid and you blow up. Really, this tape is a collection of ZX81 1K programs with added colour and (not very imaginative) hi-res graphics. Definitely not good value!

Speaking of Malcolm Evans, he has a couple of new programs, the first being *3D Tunnel*. Most of you have probably seen this now, but in case you have taken to your fallout shelter already, this one takes place in a tunnel (OK, so it's pretty obvious!), that constantly winds, rises and falls as it snakes along. You are rushing down it, and have to zap the various fauna that come bounding towards you.

You'll see frogs, rats, spiders and bats on the various levels, and, if you have the larger memory, the ultimate horror, a London Underground tube train! No, you can't shoot that, you can only press yourself against the wall and goggle in amazement as it rushes past you!

Twist and turn in any direction

3D Man's new release *Knot in 3D* (but it definitely is!) must be one of the most beautiful, graphically, to be seen on the Spectrum. Like all good programs, the idea is very simple — imagine yourself in a cube of unoccupied white space. You are rushing along at breakneck speed, and a trail of green and yellow light is left behind you. From nowhere appear, at intervals, great blocks of magenta and blue, described on the cassette inlay as "Chasers", although they don't chase at all.

You can twist and turn in any direction to avoid the Chasers (and a joystick may be used as an alternative to the keyboard), but you must also avoid your own trail. Sounds easy, but as the space gradually fills up with varicoloured trails, your manoeuvring becomes ever more frantic. The whole effect becomes rather like rushing down narrow streets with tall skyscrapers on either side, and sudden dead ends.

The object is to fill as much of the space as possible before the final collision (you're allowed 18). The scenario on the cassette inlay is rather confusing, and nobody I know who has seen the game has the faintest idea what it's all about, or the strategy to employ. It is, though, the most astounding thing you'll see for a long time.



software available for it has improved beyond all recognition from the early ICL/Sinclair days. At the price of the machine, recently cut to below £100 for the smaller memory, and the average price of cassettes, £5-6, there is no software in the world to compare ... [a low rumble from *Anx-*

couple of longer range torpedoes, which are, however, bent by the gravity well around the Black Hole, so that aiming is a bit of a hit and miss affair (excuse the pun!). Getting in the way of your ship are all the wonderful shapes from the *Arcadia* stable — spinning wheels, falling nails and

EtX is the latest program from Abbex, the Games People (sic). Of course, the main protagonist here can't be confused with the main character of the film of the same — whoops! — nearly the same name. This one is a little three-foot creature with a long neck and bug eyes, not at all like the other one.

EtX's aim is to find bits of a telephone, which he can then use to phone home. Why does that phrase sound familiar? A large matrix of deep pits has to be searched by the little creature in order to find all the components, along with various treasures that will help to boost the final score.

The graphics are superb, almost sprite-like, and well up to Atari standard. 48Kers will have the added feature of speech — although this sounded to me as if the Spectrum had succumbed to a bad case of laryngitis.



Malcolm Evans, founder of New Generation Software, is the author of *Escape*, *3D Tunnel* and *Knot in 3D* for the Spectrum.

As you move about, you will travel through many zones in which you can do one of several things. You may, for instance, only call your mothership when standing in a certain spot, and you will need the complete phone. All this time you will be harassed by certain mean people like the Professor, who will whip you back to his lab for a quick experiment. You have a friend in Elliott who will come to your rescue if you are lucky. Not a bad little arcade game, and good value for money.

Now we come to *Android One*, from Vortex Software. The game is one of those guaranteed to keep you sitting, bleary-eyed, in front of your TV screen until 3 o'clock in the morning. You are in control of the android in the title, whose mission is to enter a nuclear power station and neutralise the core, which has become unstable. Racing against the clock, you must battle your way through the tortuous corridors, fighting all the while the guardians of the power station.

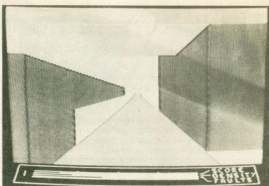
These little horrors take several forms — some come after you, whilst others just bounce up and down blocking your progress. Touch any of them, and you'll lose a life, but you do have a laser and a limited number of force fields for dire emergency. As with most of the good games in the present batch, movement may be effected either from the keyboard or by (Kempston) joystick. Humour (in the android's facial expressions) and suspense combine with fantastic graphics to make an excellent arcade game.

Jetpac, written by Ultimate Play The Game (yes, you did read that right!) is yet another extremely tough and addictive

game. This time you are an intrepid interstellar trader and your job is, frankly, plundering innocent planets of their gold and other riches. Starting off on the first planet, you must first assemble your spaceship from the bits scattered around, and then refuel using the fuel tanks dropped to you by some unseen benefactor in the sky. You can also pick up the treasures, such as bars of gold and isotopes.

All this time the, understandably, irritable natives are trying to get their own back on you. You may use your jetpack, which is strapped to your back to hover in mid-air, and your laser to zap the aliens. In true arcade style each level presents you with evermore vicious aliens. The graphics, again, are sensational.

Another new alien-zap game is *Spawn of Evil*, from DK Tronics [get their address, *Snaxthpool*, they'll pay for this!]. A rather complicated scenario and instruction program is loaded before the main program. What it all boils down to is that you can get the little blighters as they are spawned — if



you're skilful! Switch to your Galaxy Scanner (lucky you!) and see the various spawning grounds. Move your ship to a trouble spot and switch to *Fire* mode.

Newly-born aliens are plentiful and relatively easier to hit — however, you don't score so highly for getting them. If you feel lucky, you can wait for them to join together into larger creatures. Now you score much more for hitting them, but of course, it gets harder to do so, and now they fire back. Movement is inertial, that is it takes some time to accelerate to speed, and more time to decelerate, before a change of direction may be made.

Continued on next page

Firm	Program	Price
Abbex 20 Ashley Court Great Northway London NW4	ETX	£5.95
DK Tronics 23 Sussex Road Gorleston Gt Yarmouth Norfolk	Spawn of Evil	£4.95
Imagine Masons Buildings Exchange Street East Liverpool Merseyside L2 3PN	Schizoids Molar Maul Ah Diddums	£5.50 £5.50 £5.50
J K Greye Enterprises 16 Park Street Bath BA1 2TE	The Arcadian	£4.95
New Generation Software Freepost BS3433 Oldland Common Bristol BS15 6BR	3D Tunnel Knot in 3D	£5.95 £5.95
Quest 119 The Promenade Cheltenham Gloucestershire GL50 1NW	The Black Hole	£5.50
Ultimate Play The Game The Green Ashby de la Zouch Leicestershire LE6 5JU	Jetpac	£5.50
Vortex Software 26 Crawford Road Hattfield Herts AL10 0PG	Android One	£5.95



The game is a little too subtle for its own good. While one can appreciate the programming skill that has been lavished on it, it is, like the similar *Timegate*, ultimately boring.

At last, the games we've been promised from Imagine have arrived. This company, launched on a wave of very high-powered advertising, has gained an unfortunate reputation for delay — a requisite in the computer world, maybe, but exasperating all the same. Thankfully, the wait has been well worth it.

Molar Maul rewrites the history of dental science. Hands up all those of you who enjoy a visit to the dentist. Well, the rest of us can now fight back with *Magico* toothpaste, which contains the wonder ingredient, DKX 11. This combats the dreaded

from which issue the dreaded DKs. You control a toothbrush, which you can charge with a dollop of *Magico* from the conveniently-situated tube. Then scrub for dear life as the DKs start in on your teeth. Each squirt of toothpaste lasts for a couple of scrubs only, and the brush has to be recharged frequently. You have limitless amounts of *Magico*, and three brushes.

This is, like all good arcade games, completely dotty, but the great graphics and Atari-like fairground musical make it a game that will be around for a long time.

Ah Diddums (*Snaxthpool*, the Earthman is raving — your interrogation methods may need revising!) is the other game from Imagine, and has another dotty scenario. Mummy and Daddy have left the light on in

bacteria, *Dentorium* Kamikazium, the DK. These little blighters attack your teeth and, being immortal, keep on coming. Luckily, you have supplies of *Magico*, and this will restore your teeth to good health.

The screen consists of a wide-open mouth, complete with tonsils in the middle,

the nursery so that Baby won't cry (all together now, Ah Diddums!). The toys are happy because they can play. Teddy, however, wants to comfort Baby, and so tries to build a staircase out of the toybox using Baby's bricks. The other toys, knowing that if Baby stops crying the lights will be turned off, thus stopping their playtime, try and stop Teddy from climbing out.

So, Teddy's in for a tough time, with toy soldiers firing at him, giant lumps of plasticine trying to roll him flat, and rattles on the rampage. He's not entirely helpless, luckily, as he can pick up a peashooter and fire at the enemy toys. He can also roll balls at them, or place dolly boots in their way. There is also the ultimate weapon, the Jack-in-the-box! Another highly original game from Imagine, and very good value.

Grand Admiral Anxpyth: "Snaxthpool. I think we can give this solar system a miss! The natives seem to be in an advanced stage of total insanity — either gibbering about psychotic toys, or zapping aliens!"

So, as I was saying, the software for the Spectrum is improving daily. While the consumer should beware the many misleading claims being made for software in the current war of colour advertising, he may also be reasonably sure that most of the arcade games have to come up to a certain (good) standard to survive. A bright future is ahead for Spectrum gamers-players. ■

Q.E.D. Systems

experts in business systems now bringing professionalism into the home market for SPECTRUM, ORIC and DRAGON micro-computers.

THE VARIETY PACK

for the

less than
20p/program!

ORIC DRAGON SPECTRUM

25 specially selected programs
to realise the potential
of your new micro

THE BEST VALUE AROUND TODAY! ONLY £4.95

ALL ORDERS ARE
DISPATCHED WITHIN
48 HOURS

DRAGON 6809 ASSEMBLER/EDITOR

With this powerful software realise the full potential of this splendid micro by writing your own machine code programs and routines.

FULL OPERATING INSTRUCTIONS
ARE INCLUDED £6.95

DRAGON VIDEO CHALLENGE

QED quality action-packed programs
PHOTON, LINK-FOUR, MICROTHELLO
and PHANTOMS £5.95

Please send me on cassette
for my micro with memory
I enclose my cheque/postal order for £
Name
Address

QED SYSTEMS, 2 SEFTON GARDENS,
AUGHTON, Nr ORMSKIRK, LANCS L39 6RZ

No strings attached

Bob Skinner explains some of the advantages in using string arrays in programs

Arrays or dimensions are probably the first main stumbling block for any programmer. They are also one of the most useful and widely used methods for handling data in memory. Read and Data are important tools, but arrays are far easier to manipulate.

Basic supports two types of arrays, numeric and string. Numeric arrays can only hold numbers, string arrays hold characters (which means that you can use them for numbers with `Str$` and `Val$`).

Here we shall deal with string arrays, as these are most useful. Besides, numeric array handling is almost identical.

To "set-up" an array you use the reserved word `Dim`. You must also give this word parameters which refer to the size of the array you want to use. Such parameters are known as "subscripts" and allow you to fill and access the information in the array at will.

It is easiest to imagine arrays in the form of Rows and Columns, whose intersections provide Cells which can hold information, rather like pigeon-holes. Arrays can have one or more rows and one or more columns. A single dimension string array with four columns can be represented as in Fig 1.

Fig 1

	COL1	COL2	COL3	COL4
ROW 1	:	:	:	:

To create such an array in Ram, we need to give the array a name: `Ar$` for example, also its size: 4 (columns — 1 row is assumed), like this:

```
10 DIM AR$(4)
```

This particular `Dim` statement could only be used once in a program, though you can set up as many arrays as there are room for in Ram. That is, you cannot alter the number of rows or columns once the array has been *Dimensioned*.

To set up arrays with more than 1 row, you need to use two subscripts, row and column, in that order. So, to get an array, `Ar$` with 3 rows by 5 columns, we simply amend the command line to:

```
10 DIM AR$(3,5)
```

This will set up an array like this:

	COL1	COL2	COL3	COL4	COL5
ROW 1	:	:	:	:	:
ROW 2	:	:	:	:	:
ROW 3	:	:	:	:	:

Such an array is called a 2-dimensional string array. You can set up 3-dimensional arrays in some dialects of Basic with statements like `Dim Ar$(3,5,7)`, but this is beyond the scope of this article.

Each "cell" of a strong array can hold up to 255 characters — like a normal string, but check this in your machine's user manual. To put information into the array you simply use statements like:

```
20 AR$(1,1) = "HELLO"
```

This puts the word *Hello* into the cell of `Ar$` which is referenced by the subscripts 1,1 — ie, row 1, column 1. The following example should make this clear:

```
10 DIM AR$(3,5)
20 AR$(1,1) = "FILLING"
30 AR$(2,3) = "AN"
40 AR$(3,2) = "ARRAY"
```

This gives:

	COL1	COL2	COL3	COL4	COL5
ROW 1	:	FILLING	:	:	:
ROW 2	:	:	AN	:	:
ROW 3	:	ARRAY	:	:	:

To get the information out, you can simply use `Print`, as in:

```
50 PRINT AR$(1,1)
```

which will display the contents of the cell specified. Or, you can assign the contents of a cell to a simple variable as in:

```
60 LET A$ = AR$(2,3)
```

To use numbers in string arrays, first convert the number to its string representation:

```
100 X = 99
110 X$ = STR$(X)
120 AR$(3,5) = X$
```

To get numbers out, reverse the process using `Val`:

```
200 X = VAL(AR$(3,2))
```

At this point, it should be obvious that to access a given row we can use a `For`... `Next` loop to put information in or get it out. Thus, in our example, if we wanted to see the contents of the cells of row 2, we would write:

```
400 FOR C = 1 TO 5
410 PRINT AR$(2,C)
420 NEXT
```

We don't want to have to write this for every row, so we embed this loop in another:

```
390 FOR R = 1 TO 3
430 NEXT ..... INNER LOOP
```

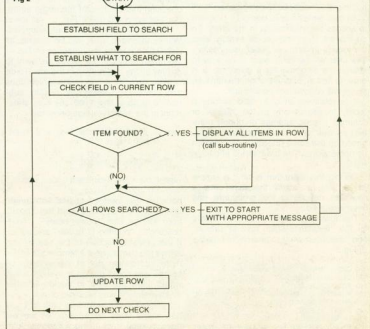
so that the program repeats the above for all rows:

```
390 FOR R = 1 TO 3: for all rows
400 FOR C = 1 TO 5: for all columns
410 PRINT AR$(R,C): print the contents of the cell
420 NEXT C: next column
430 NEXT R: next row
```

A similar technique can be used to fill the cells with information.

Continued on next page

Fig 2



A string array can be used to set up a simple database which can be sorted, searched etc. For example, we can set up an array to hold names (col1), addresses (col 2) and phone numbers (col 3) to act as an address book.

The simplest way to get the data into the array is by using *Read* and *Data* statements, although you could have the program ask the user for the information. The *Data* statements will take the general form: line no. *Data* name, address, phone no. For example:

```
9000 DATA PETER JONES, 13 HIGH STREET
      NEWTOWN, 0213-415
9010 DATA MARY PHILLIPS, 26 BROADWAY OLD-
      TOWN, 098-5647
```

Notice that you cannot put commas into the addresses, or you will have problems as the Basic interpreter will think each comma ends a data field. *Reading* this data into the array now simply requires some variables, eg, the number of rows and columns and a loop structure like the previous one. If we have 100 names, addresses and phone numbers, the program will start like this:

```
10 NR = 100: number of rows
20 NC = 3: number of columns
30 DIM AR$(NR,NC): set up array
40 FOR R = 1 TO NR: for all rows
50 FOR C = 1 TO NC: for all columns
60 READ AR$(R,C): READ a string and put it into a
  cell
70 NEXT C: do the next column
80 NEXT R: do the next row
```

Line 60 could be written:

```
60 READ A$:LET AR$(R,C) = A$
```

but this is unnecessarily complicated.

All that remains is to design a program to access the information in the array. To do this we must first decide exactly what we require in terms of "user-usefulness". The user will certainly want to be able to search the database for a given name in order to find an address or phone number, so we will concentrate on this first.

It is relatively easy to also include a facility to search any of the "fields" or columns (name, address or phone number) as well, since such searches will be based on the same principles as a search by name alone. The flowchart is shown in Fig 2.

Coding this algorithm is now a simple job — this is usually the case once a flowchart describing the procedure has been designed.

The following fragment of code caters for the "Establish which field to search" and "Establish what to search for" blocks of Fig 2:

```
90 CN$ = "NAPE": used to check input
100 CLS: clear screen
110 PRINT "N: NAME"
120 PRINT "A: ADDRESS"
130 PRINT "P: PHONE"
140 PRINT "E: END"
150 PRINT: blank line
160 PRINT "PRESS THE LETTER OF YOUR
```

```
CHOICE": prompt
170 AS = INKEY$:IF AS = "" THEN GOTO 170: read
  keyboard
180 CN = INSTR(1,CN$,AS): convert to number
190 IF CN = 0 THEN GOTO 170: key OK? if not
  repeat
200 IF CN = 4 THEN CLS:PRINT "END OF PRO-
  GRAM":END: terminate if required
210 CLS: clear screen again
220 PRINT "ENTER ITEM TO SEARCH FOR":
  prompt
230 INPUT TAS: get target string
240 GOSUB 1000: do the searches
250 GOTO 100: repeat the main menu
```

This section of code displays the menu and gets the value of the variable *CN* as the number of the field or column to search. This is achieved by testing the key pressed by the user. If it is one of the letters "N", "A", "P", or "E", then its position in *CN\$* ("NAPE") is given by *Instr* (line 180). This is a much simpler and more elegant method than such lines as:

```
170 IF AS = "N" THEN CN = 1
171 IF AS = "A" THEN CN = 2
172 IF AS = "P" THEN CN = 3
173 IF AS = "E" THEN CN = 4
```

or the hideous and unnecessarily complex formula beloved of some programmers:

```
170 CN = ABS((AS = "N") + 2*(AS = "A") + 3*(AS = "P") + 4*(AS = "E"))
```

Instr returns the value 0 if the *Target\$* is not in the *Source\$*, otherwise it returns the starting position of the *Target\$* in the *Source\$*. The general form of *Instr* is *P = Instr* (starting point in *Source\$, Source\$, Target\$*).

We now have the variable *CN* as the column number to search. We now need to design code to step through all the rows checking this column for the target string. For this we could use a *For ... (all rows)* ... *Next* loop as in the previous examples. Within this loop, we will be testing all *AR\$(R,CN)* cells for the presence of *TAS\$* — the target string. If it is found, we want to display all the information in the row. To do this we can call a subroutine which does just this — assuming the display subroutine to be at line 1100, the core statement in the search routine becomes:

```
1020 IF INSTR(1,AR$(R,CN),TAS) > 0 THEN
  GOSUB 1100
```

We use this in preference to:

```
1020 IF TAS = AR$(R,CN) THEN GOSUB 1100
```

because the former will find substrings; that is, it will pick out a word like "boat", from strings like "power-boats", "boat-buildings", "boating", "boater" and so on. It increases the scope of the search and allows the user to be a bit imprecise to get more information out of the system. Of course, we could design a system which would allow the user to decide whether direct matching was required or not.

It might prove useful to a user to know how many finds there were, so we will have to keep track using a variable such

as *TF* — *Total Finds* (do make your variables easy to remember by giving them meaningful letters). This means an addition to line 1020:

```
1020 IF INSTR(1,AR$(R,CN),TAS) > 0 THEN TF =
  TF + 1:GOSUB 1100
```

We don't want to increase *TF* in the display routine because we may want to call this routine from other areas of the program without affecting *TF*.

Finally, we will want a subroutine which suspends the program at various points to allow the user to assimilate information on the screen. A pause routine would do, but better by far is a routine which prompts the user to press a key in order to proceed. This is necessary in order to prevent too much information scrolling up the screen too fast to be any use to the user. This will take the form:

```
1200 PRINT
1210 PRINT "PRESS THE SPACE BAR TO CON-
  TINUE"
1220 AS = INKEY$
1230 IF AS <> CHR$(32) THEN GOTO 1220
1240 RETURN
```

Ideally, the prompt would appear at the foot of the screen and be erased just before the *Return* is executed.

The coding for the search routine is thus:

```
1000 TF = 0
1010 FOR R = 1 TO NR
1020 IF INSTR(1,AR$(R,CN),TAS) > 0 THEN TF =
  TF + 1:GOSUB 1100
1030 NEXT
1040 PRINT
1050 PRINT "NUMBER OF FINDS = ",TF
1060 GOSUB 1200
1070 RETURN

1100 FOR C = 1 TO NC
1110 PRINT AR$(R,C)
1120 NEXT
1130 GOSUB 1200
1140 RETURN

1200 PRINT
1210 PRINT "PRESS THE SPACE BAR TO CON-
  TINUE"
1220 AS = INKEY$
1230 IF AS <> CHR$(32) THEN GOTO 1220
1240 RETURN
```

Notice that "UPDATE ROW" in Fig 2 is automatically taken care of by the *Next* in line 1030, being part of the loop which deals with each row in turn.

You should be able to modify this program to improve its appearance on-screen; allow the user to enter the data to begin with and, if you can store string arrays to tape, you have the heart of a personal database!

To sum up, the most important points here are:

- The use of string arrays to hold related information
- The building of routines around "core" statements
- Constructing a program from "blocks" of algorithms
- Designing part of a program according to the user's point of view

48K SPECTRUM SOFTWARE VIDEO TAPE LIBRARY SYSTEM

Features:

- AUTOMATIC TAPE NUMBERING
- FORWARD AND BACKWARD PAGEING
- SEARCH ON TITLE
- SEARCH FOR REQUIRED TIME SLOT
- DIRECT INDEXING BY TAPE
- DELETION OF UNREQUIRED ENTRIES
- CHANGE OF TAPE DURATION
- PASSWORD SECURITY
- PRINT FACILITY (IF REQUIRED)
- ANY NUMBER OF LIBRARIES

Maximum of 99 tapes and 400 individual entries with up to
entries per tape. £6.00

PERSONAL DIARY SYSTEM

Features:

- FORWARD AND BACKWARD PAGEING
- DELETION OF UNREQUIRED ENTRIES
- PASSWORD SECURITY
- PRINT FACILITY (IF REQUIRED)
- DIRECT INDEXING BY DAY
- ANY NUMBER OF DIARIES FOR ANY YEAR
- IDEAL FOR APPOINTMENTS, ETC

Maximum of 999 entries with up to 10 entries per day
£4.00

Full operating instructions supplied, price includes postage and packing.

Cheques/postal orders to:

POOLHOST LIMITED

29 Rockfarm Drive, Little Neston
South Wirral L64 4DY



Centronics Interface

The Centronics Interface consists of a cable and software on cassette which will allow a centronics style parallel printer to be used with the VIC-20. £29.00 plus VAT

RS232 Interface

The RS232 Interface is a device which fits onto the VIC's user port and can be connected to an RS232 serial device, such as a printer, using a cable. £29.00 plus VAT

IEEE-488 Interface

A cartridge to allow your VIC-20 to use Commodore disc drives, printers or other devices which use the Commodore IEEE-488 standard. £39.00 plus VAT

STACK

Computer Services Limited

290/298 Derby Road
Bodley, Merseyside L20 8LN
Tel. Sales 051-933 5511
Service 051-933 3355
Telex 627025 (Stack-G)

This program was written for the Dragon 32, but it is designed to be easy to convert for all micros.

```
10 REM DATABASE+SEARCH ROUTINE
20 REM SET UP ARRAY
30 CN$="NAPE"
40 NR=5
50 NC = 3
60 DIM AR$(NR,NC)
70 FOR R = 1 TO NR
80 FOR C = 1 TO NC
90 READ AR$(R,C)
100 NEXT C
110 NEXT R
120 REM ARRAY SET UP
130 REM SEARCH ROUTINE MENU
140 CLS
150 PRINT "N...NAME"
160 PRINT "A...ADDRESS"
170 PRINT "P...PHONE"
180 PRINT "E...END"
190 PRINT
200 PRINT "PRESS THE LETTER OF YOUR CHOICE"
210 A$ = INKEY$:IF A$ = "" THEN 210
220 CN = INSTR(1,CN$,A$)
230 IF CN = 0 THEN GOTO 210
240 IF CN = 4 THEN CLS:PRINT "END OF PROGRAM":END
250 CLS
260 PRINT "ENTER ITEM TO SEARCH FOR"
270 INPUT TA$
280 GOSUB 310
```

```
290 GOTO 140
300 REM SEARCH ROUTINE
310 TF = 0
320 FOR R = 1 TO NR
330 IF INSTR(1,AR$(R,CN),TA$) > 0 THEN TF = TF+1:GOSUB 400
340 NEXT
350 PRINT
360 PRINT "NUMBER OF FINDS=":TF
370 GOSUB 470
380 RETURN
390 REM SUBROUTINE TO DISPLAY ALL CELLS IN A ROW "R"
400 FOR C = 1 TO NC
410 PRINT AR$(R,C)
420 NEXT
430 GOSUB 470
440 RETURN
450 REM END OF DISPLAY ROUTINE
460 REM SPACE TO CONTINUE SUB ROUTINE
470 PRINT
480 PRINT "PRESS THE SPACE BAR TO CONTINUE"
490 A$ = INKEY$
500 IF A$ <> CHR$(32) THEN GOTO 490
510 RETURN
520 REM END OF ROUTINE
530 REM DATA STATEMENTS
540 DATA PETER JONES,13 HIGH STREET NEWTOWN,£213-415
550 DATA MARY PHILLIPS,26 BROADWAY OLDTOWN,£98-5647
560 DATA FRANK PAULSON,5 FARM COTTAGES WRAIXALL WILTS,7654-5643
570 DATA FRED BLOOGS, 34 NORTH STREET HORNCHURCH ESSEX,453-7865
580 DATA MARIA TEMME,198 SOUTH STREET DEVONPORT LINGS,£956-3462
```



Play it again... and again

Gordon McQueen explains
how to record and replay sound
on your micro

This program will enable your Dragon or color computer to repeat any sound you input to it.

To input sound to the computer the cassette is used in either of two ways. The first method is the easiest, all you do is record the speech or noise on a tape and then play that tape into the computer.

The second method will only work with some cassette recorders. Remove all the jack plugs from the tape deck, except for the ear jack. Then, look inside the cassette compartment for a little lever which is located opposite the record head.

If you have difficulty locating this lever, then look at a cassette tape and find the tabs that you break if you want to protect the tape from accidental recording. Now, if you look into the cassette compartment where this tab would be positioned you will see the lever.

Once the lever has been located, simply press it in and press record and play on your recorder. When you speak into the microphone on your tape deck, the signal will be sent into the computer and stored.

The machine code routines used to record and playback the sound begin at memory locations 7D00 hex and end at 7D5A hex. The recorded sound is stored between locations 1E00 hex and 7CFF hex, hence 32K of memory is required. It would be possible to change these memory locations, but the amount of storage would be greatly reduced.

The record program reads the cassette input, which is bit 0 of location FF20 hex, and this value is added with 1 to produce a 1 or a zero. Since the required information is only one bit long, then one byte can hold eight bits of information.

The byte being used is shifted to the left and, if the cassette input is a one, then the contents of the byte are incremented,

which raises bit zero. If this procedure has been performed eight times, then checks are made to see if the end of the data has been reached. If not, another byte of information is input.

The replay routine enables the sound output by *oring* the contents of FF23 hex with eight. Each byte of data is then taken in turn and has its bits tested using the *Bit* instruction, which performs an *and* operation and sets the condition code register accordingly, but does not affect the register the operation was carried out on. If, after the *Bit* operation, the result is zero then the sound output addresses FF28 hex is cleared otherwise it has *Fd* hex stored in it. If *FF* hex was stored in this location and Tandy's *Edtasm+* cartridge was being used then the cartridge would be reset. This process is repeated until the end of the data has been reached.

As well as the assembler listing, I have included a Basic program which loads the machine code from data statements. Instead of using the *Delusm* statement, I have used the *Exec* statement as I have found that the Dragon can only access *Usro*, whereas the Tandy color computer can access all 10 of the *Usr* routines. Perhaps there is a bug in the Rom. ■

7D00		00100	ORG 32000	7D2B 8E 1E00	00440	LDX #7680
	FF20	00110 IN	EQU 65312	7D2E 108E 7D52	00450	LDY #DATA
	FF28	00120 OUT	EQU 65320	7D32 A6 80	00460	LDA ,X+
7D00 8E 1E00		00180 START	LDX #7680	7D34 A5 A0	00470	BITA ,Y+
7D03 6F 84		00190 GETBIT	CLR ,X	7D36 27 07	00480	BEQ CLEAR
7D05 5F		00200	CLRB	7D38 C6 FD	00490	LDB #FD
7D06 68 84		00210 CHECK	ASL ,X	7D3A F7 FF28	00500	STB OUT
7D08 B6 FF20		00220	LDA IN	7D3D 20 03	00510	BRA FIN
7D0B 84 01		00230	ANDA #1	7D3F 7F FF28	00520	CLR OUT
7D0D 27 02		00240	BEQ ZERO	7D42 108C 7D5A	00530	CMPI #WELLY
7D0F 6C 84		00250	INC ,X	7D46 26 EC	00540	BNE SNDOUT
7D11 5C		00260 ZERO	INCB	7D48 108E 7D52	00550	LDY #DATA
7D12 C1 08		00270	CMFB #8	7D4C 8C 7D00	00560	CMPI #7D00
7D14 26 F0		00280	BNE CHECK	7D4F 26 E1	00570	BNE SND
7D16 30 01		00290 NEXT	LEAX ,X	7D51 39	00580	DONE
7D18 8C 7D00		00300	CMPI #7D00	7D52	00590	DATA
7D1B 25 E6		00310	BLO GETBIT	7D54	00600	FDB #8040
7D1D 39		00320 AAA	RTS	7D56	00610	FDB #2010
7D1E B6 FF23		00330 GO	LDA >#FF23	7D58	00620	FDB #8004
7D21 8A 08		00400	ORA #8	7D5A 12	00630	FDB #8201
7D23 87 FF23		00410	STA >#FF23		00640	WELLY
7D26 86 FF		00420	LDA #FF			END
7D28 87 FF26		00430	STA OUT			
				00000 TOTAL ERRORS		

Continued on page 23

JOYSTICK SOFTWARE



Spectrum Joystick Interface
ONLY £15.00

Allows you to use any Atari/Commodore type Joystick with the Spectrum. Simply plugs into the Spectrum. Complete with 12 months' guarantee.

JOYSTICK COMPATIBLE SOFTWARE FROM

KEMPSON

FOR THE SPECTRUM
ORDER NOW!

- | | | |
|---|-------------------|--------|
| <input type="checkbox"/> Astro Blaster | 16K Quicksilver | £4.95 |
| <input type="checkbox"/> Blind Alley | 16K Sunshine | £4.95 |
| <input type="checkbox"/> Cosmic Guerilla | 16K Crystal | £5.95 |
| <input type="checkbox"/> Cosmos | 16K AbbeX | £5.95 |
| <input type="checkbox"/> Cyber Rats | 16K Silversoft | £5.95 |
| <input type="checkbox"/> ETX | 16K AbbeX | £5.95 |
| <input type="checkbox"/> Frenzy | 16K Quicksilver | £4.95 |
| <input type="checkbox"/> Frogger | 16K DJL | £5.95 |
| <input type="checkbox"/> Galaxians | 16K Artic | £4.95 |
| <input type="checkbox"/> Gulpman | 16K Campbell Sys. | £4.95 |
| <input type="checkbox"/> Jet Pac | 16K Ultimate | £5.95 |
| <input type="checkbox"/> Joust | 16K Softex | £5.95 |
| <input type="checkbox"/> Knot in 3D | 48K New Gen | £5.95 |
| <input type="checkbox"/> Mazeman | 16K Abbersoft | £5.95 |
| <input type="checkbox"/> Meteoroids | 16K Softex | £4.95 |
| <input type="checkbox"/> Night Flite | 16K Hewson Cons | £5.95 |
| <input type="checkbox"/> PSSST | 16K Ultimate | £5.95 |
| <input type="checkbox"/> 3D Tunnel | 16/48K New Gen | £5.95 |
| <input type="checkbox"/> Time Gate | 48K Quicksilver | £6.95 |
| <input type="checkbox"/> Slippery Sid | 16K Silversoft | £5.95 |
| <input type="checkbox"/> Spookymen | 16K AbbeX | £4.95 |
| <input type="checkbox"/> Conversion Tape I | Kempson | £4.95 |
| <input type="checkbox"/> Conversion Tape II | Kempson | £4.95 |
| <input type="checkbox"/> Spectrum joystick interface only | | £15.00 |

Please tick appropriate boxes.

Prices include P&P and VAT. Overseas prices add £4.00 P&P. Total £

Cheques/Postal Orders should be made payable to Kempson (Micro) Electronics Ltd.

Name _____ Signature _____

Address _____

Please debit my Access/Visa* Account No. _____

Kempson (Micro) Electronics Ltd, Dept PCW6
180a Bedford Road, Kempston, Bedford MK42 8BL



* Delete as applicable

IT'S ANOTHER CLEVER IDEA FROM STACK

THE EXTRA CARTRIDGE SOCKET AND ROM SOCKET MAKE IT VERY VERSATILE!!!

AND SO ECONOMICAL!

IT'S GREAT! I CAN ADD EXTRA MEMORY USING MY ROCKET MONEY

Have YOU got your STACK STOREBOARD yet?

Expand your VIC-20 memory from a youthful 5k to a mature 32k. Supplied with 8k fitted, the STOREBOARD allows you to build up the size of your VIC-20's memory, whenever you NEED more memory or, whenever you can AFFORD it! This means you get a FLEXIBLE system that SAVES YOU MONEY!!!

Compare these prices...

Stack 8k Storeboard	49.00	Commodore 16k Cartridge	65.17
1st 8k Ram Pack	21.00	8k Cartridge	39.00
2nd 8k Ram Pack	21.00	32k Cartridge	39.00
4x Ram Pack	11.00	4 slot Motherboard	29.00
27k Expansion	102.00	27k Expansion	159.30
TOTAL SAVING	£7.30		

* Upgrading your STOREBOARD is easy! Simply replace the detachable cover and you're ready to go. (See page 18 for details.)

• **ADDED FEATURE!** A socket is provided for your VIC-20 to allow you to use extra memory. Once again you can save £12.50 by using STACK's extra sockets on your Storeboard instead of the more expensive cartridges.

Prices exclude Value Added Tax and are correct to the time of going to press.

STACK

Computer Services Limited

290/298 Derby Road,
Bottle, Macclesfield L20 2BA
Tel: Sales 051-933 5511
Service 051-933 3355
Telex 627026 (Stack-G)

GREAT VALUE FOR MONEY WITH OUR

SPECTRUM

SOFTWARE
GAMES FOR THE 16K or 48K SPECTRUM

MONGOOSE (m/c) and BEAR ISLAND £4.95

Fast and furious arcade action with these colourful high speed games.

REVERSI (m/c) and POKER DICE £4.95

Classic strategy and addictive gambling games.

TIME-LINE (m/c) and TASKS £4.95

A superb 16K text adventure and a collection of mind stimulating puzzles.

MAGIC CASTLE (m/c 48K only) £4.95

A gripping adventure. Rescue the princess, but beware of booty traps and vampires.

3D MAZE OF GOLD (m/c) £5.95

Amazing full colour, high resolution views as you walk around a large labyrinth.

EXTEND SPECTRUM BASIC (16K or 48K)

WITH WHITE NOISE AND GRAPHICS (m/c) £5.95

Adds many useful commands to BASIC including a window system and true explosion type sound effects. Extensive manual supplied.

EDUCATIONAL PROGRAMS

CESIL £5.95

A widely used O-level teaching language available for 16K or 48K.

Spectrum Dragon 32 and 16K ZX81. Supplied with a comprehensive manual.

HAL £5.95

Another popular O-level teaching language for the 16K or 48K Spectrum.

VISUAL PROCESSOR £5.95

Provides an 'on screen' display of a simple Micro-processor illustrating its internal operation as it runs your programs. With comprehensive manual. For the 16K or 48K Spectrum.

Our Software is now available from many computer shops nationwide, or direct from us by post or phone. SAE for details. Dealer enquiries welcome.

GILSOFT

30 Hawthorn Road, Barry
South Glam CF6 8LE
Tel: (0446) 736369

TELEPHONE YOUR ORDER
WITH





for LYNX, DRAGON, SPECTRUM
and ZX81 Software

MONSTER MINE by W. E. MacGowan. Escape from the mine with as much money as you can, but don't get closed in or caught by the prowling monsters. An addictive machine code game, with superb graphics and save facility. Price (LYNX and DRAGON) £7.95. Price (SPECTRUM and ZX81) £4.95.

SULTAN'S MAZE by Christopher Hunt. Enter the 3D Maze in search of the Sultan's jewels, but beware, your strength may run out, or you may come face to face with the Mad Guardian. A multi-difficulty game with fantastic graphics and sound. Price (LYNX and DRAGON) £7.95.

CHARACTER GENERATOR by John Line. A program for the programmer, allowing creation and saving of character sets/shape tables and subsequent inclusion into users basic program. Demonstration program and full ASCII character set included. Price (DRAGON) £9.95.

GEMPACK IV by W. E. MacGowan. Two great machine code games, with full colour graphics. In *Sea Harrier* you must land your plane on the aircraft carrier, after dispersing the clouds with chemical bombs, but don't hit the ship! In *Sea Chase* you must depth charge the wolf pack without being sunk. Both with four levels of play from easy to kamikaze! Price (LYNX and DRAGON) £7.95.

CHATEAU by Pete Allen. A new type adventure, in which you must wander the Count's old mansion in search of treasure! Of course, when the Count died and hid his treasure, he also left lots of unpleasant surprises for those brave enough to try and seek out his riches! Come face to face with Ghouls and Ghosts, Vampires and Trolls; do you run or fight? Will the mysterious Travel Agent suddenly appear and whisk you away to far off places? Where can you find the key or the lamp? Is the clock body-trapped? Will you die a cold and lonely death, or will you win through to claim the fantastic treasures of The Chateau? Price (DRAGON) £7.95.

GAMES PACK II by Christopher Hunt. **REVERSI**. Pit your wits against the LYNX with this easy to learn, yet extremely demanding board game. Five skill levels, from novice to grand master. **SNAKE**. Guide the snake to the food, but watch out, he will grow and must not eat the wall or himself.

PONTON. An excellent implementation of a favourite card game in full colour with sound. LYNX is a mean Banker. Price (LYNX) £7.95.

LYNX COMPUTING BOOK by Ian Sinclair. Excellent book, which the beginner will find an invaluable aid, in helping to unravel the LYNX'S many varied features! Price £6.95.

All titles available mail order or Access

All returns despatched by return of post

GEM SOFTWARE

UNIT D, THE MALTINGS, SAWBRIDGEWORTH, HERTS

Telephone: (0278) 723567

TRADE ENQUIRIES WELCOME - PLEASE ASK FOR DEALER PACK

TO MAKE A SUPER GAME INTO A FANTASTIC GAME YOU NEED SOFTLINK 1.

This will allow you to use a Kempston type joystick with all the following Spectrum games:

Arcadia, Penetrator, Horace Goes Skiing, Spectres, Flight Simulation and Space Zombies.

ONLY £4.95

SPECIAL OFFER

Spectres plus Softlink 1 **£11.00**

Arcadia plus Softlink 1 **£9.00**

SUPER SOFTWARE FOR YOUR CBM 64

Cyclons, Pakacuda, Escape MCP, Centropods,

Anihilator, at only **£5.65 each**

FOR YOUR UNEXPANDED VIC

Escape MCP, Pakacuda, English Invaders, The Catch, Paratroopers, Antimatter Splatter, at only

£5.65 each.

Crazy Kong only **£6.50.**

FOR ANY VIC

Catcha snatcha, Wacky Walters, Arcadia only **£5.25 each.**

FOR YOUR VIC PLUS AT LEAST 8K

Critters, Cyclons, only **£5.65 each.**

New for your 64

Star Trek, Panic 64, Frogger 64

Cheques and postal orders to

BYTEWELL

203 COURT ROAD, BARRY,

SOUTH GLAMORGAN CF6 7EN

Tel: (0446) 742491

Dragon & Dungeon

NUMBER ONE FOR THE DRAGON

LATEST DRAGONWARE

ARCADE GAMES: Mined Out (Quicksilver) £5.95, 'Dragonhawk' (Pentagon) £5.95, 'Vultures' (Dragon Galaxies, Morrison) £6.95, 'Droids' (great new action game, Morrison) £6.95, 'Droids' (Tren-type game, Cable Software) £8.75, 'Spider' (Premier) £4.95, 'Scanner' (an entirely new style of arcade game by Bambi) £8.45, 'Sniper' (Soft Joe's) £5.50, 'The Dragon 32 Gamesmaster' £5.95.

Watch out for the best arcade game yet — Programmers' Guild's fantastic 'Ninja Warrior' (17 screens!). In stock shortly.

ADVENTURES: Alien Odyssey (the first two parts of a giant 60K-plus saga) £9.95, 'Into the Labyrinth' £7.95, 'Danger Island' £8.95, 'Chateau' £7.95, 'Jungle Search' £6.95, 'Volcanic Dungeon' £5.00.

Best-seller with Windsor's mammoth 'Ring of Darkness' £10.00.

JUNIOR PROGRAMS: 'Baby Dragon' (Teddy Bears' Picnic and Koko the Clown) £5.95, 'St. George and the Dragon' £6.95, 'Pirates' £8.50, 'Infant Pack' (pre-school letters and numbers) £3.95, 'Action Pack' (mazes and simple arcade) £2.95.

UTILITIES: Editor/Assembler/Monitor cartridges and manuals Compuserve £30.45, Maze £29.95, RS232C Interface Unit £49.50, Monitor Sound Unit £37.50, Salamander Graphics System £9.95.

BOOKS: 'Dragon Extravaganza' £4.95, 'Making the Most of your Dragon' (highly recommended) £5.95, plus 50p postage, 'The Power of the Dragon' £5.95, plus 50p postage, 'Learning to use the Dragon 32' £4.95, 'Dynamic Games for the Dragon 32' £4.95, 'Know your Dragon' (a friendly introduction to a trendy computer) £5.95.

DRAGON OWNERS CLUB

The Dungeon is also the home of the largest Dragon Owners Club in the UK (or, since members are scattered through Europe to Africa and the Middle East, should we say "the world"!).

The club magazine, *Dragon's Teeth*, is published monthly and includes news, reviews, advice and information exchange for dedicated Dragon-bashers. Free members' adverts, monthly offers (some members have already saved the cost of their subscription), competitions and, for extrovert Dragonards, badges and bomber jackets.

Annual Membership: £6.00 (£8.00 overseas), Six-month Trial Sub £3.25 (£4.25 overseas)

P.O. Box 4, Ashbourne, Derbyshire, DE6 1AQ. Tel: (0335) 44626

Memories are made of this

Ian Logan looks at the Spectrum memory map in the first of a five-part series

In all microcomputers, it is necessary to allocate different parts of the memory map to different tasks. The user is not usually aware of this, but it does affect the 'appearance' of the machine considerably.

In the Spectrum's memory map the first area, from address 0 — address 16383 (0000h-03FFh) is given over to the Rom (Read Only Memory). This single chip contains a complex machine code program that forms the operating system and the Basic interpreter of the Spectrum. It is not possible to move the Rom program to any other part of the memory map, as it contains many absolute addresses and Z80 Rst instructions that are dependent on the program being at address 0 onwards. It is however, possible to page-out the Rom completely, which happens whenever the 'shadow' Rom of the microdrive interface unit is used.

There are many subroutines in the Rom that can be used via the Basic *USR* command and some of them will be detailed in this article.

There are four fixed-length areas above the Rom. The first one is the display file (6K) that holds the bit by bit representation of the screen display. The second area is the attribute space (3/4K) that holds the colour details for the character areas of the screen display. It is clearly a limitation of the Spectrum that only two colours can be held for a whole character area at any time. The provision of more memory to this purpose would have made the Spectrum much more expensive.

The third area is the printer buffer (1/4K). This buffer allows for the storage of 32 characters and thereby applies some limitation when lines of a longer length are to be printed. If the printer buffer were longer, say 80 characters, then printing would be easier, but extra locations would have to be dedicated to this purpose.

The fourth fixed-length area is the system variables space. This is a most important part of the Ram and forms a storage area for the many temporary values that have to be held when the Spectrum is being used. The most important system variables are the set of 'pointers' that show where the 'dynamic areas' are to be found.

Within the system variables area there are two special sub-areas. The first of these is the streams area that holds 'offset' values for each of the 19 streams that can be used in the Spectrum system. The second is the calculator's memory area. This forms a temporary store for six 5-byte floating-point numbers and is used as an ordered scratch-pad when performing calculations of many kinds. Overall 182 locations (or 239 locations when the 'shadow' Rom is called), are used to hold the

system variables of the Spectrum.

Above the fixed-length areas, starting at 23734 (5CB6h) — or 23792 (5CFOh) — are the dynamic areas of the Spectrum. These areas are of varying length and position. The length allocated to a particular area, at a given moment, depends on how much is to be held in that area at that moment — and the position depends on the size of the areas beneath it. In the Spectrum, locations are allocated to the dynamic areas for a variety of purposes but once the locations are no longer required then they are 'reclaimed'. The locations that are 'free' constitute the 'spare' area above the dynamic areas and below the machine stack.

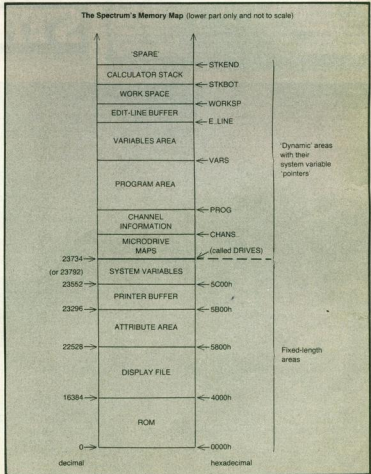
The first of the dynamic areas is the microdrive map. This area will have

0,32,64,...,256 locations, depending on how many microdrives are *Open* for use. As it is possible to hold 256 bits in each block of 32 bytes, a microdrive can have up to 256 sectors with each sector having a flag that shows whether it is 'free' or 'busy'.

The second dynamic area is the channel information space. This area is addressed by the pointer *Chans*. In this area is held the data referring to the input and output devices currently available to the Spectrum. In the basic Spectrum there are four devices detailed in this area: the keyboard, the screen, the work space and the printer.

For each device, the data consists of an 'output address', an 'input address' and an 'identifying letter'. However, when the microdrive network RS232 interface unit is fitted, it is possible for the 'shadow' Rom to create channel information for these devices. In the cases of microdrive and network channels, it is necessary to set up input and output buffers which are also put in the channel information area.

One of the features of the Spectrum system is the way in which the various



available channels can be linked to the Basic streams. Once linked, the 'stream-bytes' (held in the streams area) hold the 'offset' between the starting location of the required channel information and the address held in *Chains*. Note that several streams may be linked to a single channel at the same time, but that it is impossible, and illogical, to attempt to link one stream to more than one channel.

The third dynamic area is the Basic program area. To the user, it appears that this area is 'in the television' when a listing is being shown, but in reality any lines that have been entered by the user into the Spectrum are stored in the program area. A basic line in this area is stored in the following format:

the line number, the remaining length, the line itself and finally a carriage return character.

The lines are all stored in ascending order and contain Ascii characters, tokens, control characters and the special floating-point forms. The latter are inserted in syntax time and lead to a faster run time. All decimal numbers are followed by these floating-point forms, although to the user they are normally invisible.

When a listing is produced, the Basic lines are considered in turn. The line numbers are displayed as integers, the tokens are expanded to give the appropriate characters, ordinary Ascii characters are printed and control characters dealt with. The floating-point forms are simply ignored.

Above the program area comes the variables area. This area is only used to hold the current values for Basic variables. All numbers are held in five bytes — either in true floating-point form or in the short integer forms — all strings are held as 'strings of characters'.

There are two points of special note concerning the variables area: 1) 'Garbage collection' is fully integrated with string variable creation and there are

never any 'unattached' strings to be 'collected'.

2) The elements of a *For-Next* variable are manipulated by addressing such a variable temporarily as the 'calculator's memory area'. By so doing the subroutines for handling the memory area can be used for a second purpose, thereby saving room in the Rom program.

The next area is the edit-line buffer, which holds the characters entered by the user during 'editing'. These entries can form a Basic line, with a line number that subsequently will be added to the program area, or a 'direct Basic command' that will be executed immediately. Interestingly, the 'edit-line' has the line number '-2' but this is only given during run-time (owners of ZX80s might recognise this '-2').

Above the edit-line comes the work space. This is a most interesting area, as it can be filled from either end as necessary but only 'cleared' in toto. The lower part of the work space is used for replies to the Basic command *Input*. In such cases the work space is used instead of the edit-line buffer, allowing subroutines within the Rom to be used again for two purposes. The upper part of the work space is a true 'scratch-pad' area and is used for a variety of purposes — such as the evaluation of *Val* expressions, the holding of tape-headers, etc.

The last of the dynamic areas is the calculator stack. Once again, this acts as scratch-pad for floating-point numbers (and string descriptors). Indeed there is an internal stack language within the Spectrum for manipulating the items of this stack.

Above the calculator stack comes the 'spare' area that extends as far as the machine stack. In a Spectrum an estimate of the size of this area is given by the line:

```
PRINT 65536-USR 7962:" bytes are free"
```

As explained earlier locations are 'allocated' to the various dynamic areas as

required by current needs — these locations are then 'reclaimed' when no longer needed. Indeed, as locations are 'allocated' or 'reclaimed' all the bytes above the 'position of change' have to be moved up/down as needed. Also, the pointers held in the system variables area that point past the 'position of change' have to be increased/decreased as required.

The subroutine for moving the dynamic areas 'up' is to be found at address 1655h and is named, by myself, *Make-room*, and by Sinclair, *Insert*. In order to call this routine the *BC* register pair has to hold the number of bytes to be added and the *HL* register pair the 'position of change'. The actual lines of the subroutine are:

```
MAKE-ROOM (INSERT) EQU 1655h
PUSH HL
CALL 1F05h,TEST-ROOM (CHK. SZ)
POP HL
CALL 1664h,POINTERS (REMGST)
LD HL, (STKEND)
EX DE,HL
LDDR
RET
```

Notes:

The *Test-room* subroutine will give error 4 — 'Out of memory' if there are insufficient 'spare' locations. The *Pointers* subroutine increases all the necessary pointers by 'BC'. The *LDDR* instruction does a block moving operation to copy up all the bytes required.

The 'reclaiming' of bytes is performed most easily by using the *Reclaim-2* (*De-irec*) subroutine. Once again the *BC* register pair holds the 'length' of the area and the *HL* register pair the address of the 'position of change'. The *Reclaim-2* subroutine is at 19E8h.

It may interest readers to know that there is a definite 'bug' in the 'reclaiming' code, in that the block of memory that is moved is too large. Fortunately no harm is done.

The next article in this series will discuss *Syntax Checking*. ■

Table 1

CLASS-00	- No further operands.
CLASS-01	- Used in LET. A variable is required.
CLASS-02	- Used in LET. An expression, numeric or string, must follow.
CLASS-03	- A numeric expression must follow. Zero to be used in case of default.
CLASS-04	- A single character variable must follow.
CLASS-05	- A set of items may be given.
CLASS-06	- A numeric expression must follow.
CLASS-07	- Handles colour items.
CLASS-08	- Two numeric expressions, separated by a comma, must follow.
CLASS-09	- As for CLASS-08 but colour items may precede the expressions.
CLASS-0A	- A string expression must follow.
CLASS-0B	- Handles cassette routines.

DATABASE

**BBC MICRO (32K) DRAGON 32 ORIC 1 (48K)
SINCLAIR ZX81 (16K) SPECTRUM (16K/48K)**

The DATABASE represents the very latest in information retrieval reporting systems. Ideal for business and especially at home, can be used for endless filing applications by beginner or expert, for hobbies or collections etc. Features include dynamic variable length data, sort, powerful search and erasure. Fully 'menu' driven and incorporates user personalisation, save/load and printer options etc. We sincerely believe this is the lowest cost, professional standard DATABASE on the market.

Exclusive unbeatable price of only £4.95 fully inclusive of manual, DATABASE software cassette and 1st class post.

**Send cheque or P.O. to: DATABASE SYSTEMS, Dept W4
82 Towers Road, Poynton, Cheshire SK12 1DF.**

PROGRAMMERS — 35% guaranteed royalties with optional cash advance for any good software. Send now for evaluation.

DEALERS WANTED

FIFTY ARCADE GAMES FOR YOUR MICRO

For a limited period we are offering 50 first-class games at a special introductory price. To be sure of your copy order now.

Spectrum 16K or 48K.....	£8.99
Dragon 32	£8.99
Oric 1	£8.99
Sinclair ZX81 1K	£4.99
ZX81 16K	£5.99

All tapes post free. Mail order only. Cheques/POs payable to Anco Software, 25 Corsewall Street, Coatbridge ML5 1PX.

Long division...

Jeremy Ruston explains how to translate simple arithmetical operations into assembly language routines

One stumbling block when you are learning assembly language is the total absence of some of the features that are taken for granted in Basic. These include instructions for such simple operators as multiplication and division, program control statements such as *For* — *Next* and *Repeat* — *Until* loops. This article is designed to show you how easy it is to translate your knowledge of arithmetic into assembly language routines, and so to develop routines for addition, multiplication, subtraction and division in assembly language with the minimum of effort on your part.

This article is aimed at users of the 6502 micro-processor inside the BBC Micro. The techniques can easily be applied to other processors, such as the 6809 and the Z80. (In the case of the Z80 you will have to adopt slightly different programming methods. This is because the register orientated architecture of the Z80 is very different from that of the 6502, where virtually all instructions reference external memory.)

If you have studied the 6502 instruction set, you will have discovered the instructions used for shifting the bits in a byte left or right. These instructions come in four forms:

Asl — shifts the contents of a memory location, or the accumulator, one bit to the left. The least significant bit assumes a value of zero. For example, the binary number 01101011 (6B hex, 107 decimal) would turn into 11010110 (D6 hex, 214 decimal) after an *Asl* instruction. The most significant bit of the original number is always copied into the carry flag. The good thing about the *Asl* instruction is that it multiplies by two each time a shift is carried out.

Lsr is the opposite of *Asl*, in that it shifts a byte one position to the right. The most significant bit becomes zero and the least significant bit is copied into the carry flag. Consequently, it divides a memory byte by two.

Rol is identical to *Asl*, except that the least significant bit is not automatically set to zero, instead the current status of the carry flag is used.

Ror is identical to *Lsr*, except that, like *Rol*, the most significant bit is set to the carry flag.

These last two instructions allow you to shift numbers which are larger than a single byte wide. For example, to shift the four bytes starting at address &80, you could use:

```
Asl &80
Ror &81
Ror &82
Ror &83
```

The *Asl* instruction as it stands can be used to multiply by 2, 4, 8, 16, and so on.

This can be done because if you follow one *Asl* instruction by another, the effect of each is compounded. For example, three *Asl*s will multiply by 2 three times, giving $2^2 \times 2$. This is a total multiplication factor of eight. If you continued along these lines you would get factors of 16 and 32, etc.

But you may wish to multiply by a number other than 2, 4, 8, 16, 32, etc. This is relatively easy to do. Given a multiplication factor, say five, we can see that multiplying X by 5 can be represented as $4 \times X + X$. Therefore, to multiply a number by 5, one need only multiply by 4, using the arithmetic shift left instruction, and then add on the original number.

This technique can be extended to apply to other multiplication factors. For example, we can represent a multiplication by 7 as $4 \times X + 2 \times X + X$. This may not appear to bring us any closer to a fully general multiplication routine which will multiply any two numbers together, but it does come nearer that point.

Part of the solution is to examine our original theory of multiplying by low numbers. We started off with $5 \times X$. Five in binary is 0101. The weightings assigned to each binary digit start at 1 and ascend through 2, 4, 8, etc., multiplying by two each time. The interesting thing to note is that when we were doing multiplication in terms of arithmetic shifts and additions, we multiplied by 4 and then 1 for a multiplication of five. Obviously there is a connection between what you must multiply X by and the binary representation of the number that is being multiplied.

We can now say that to multiply any two arbitrarily long binary numbers we must scan one of the numbers and for every position in which there is a 1 in the number (a bit is set), we must multiply the other number in the calculation by the weighting assigned to the original bit position. We

must then add together the results of these calculations.

In other words, if the detected bit has a 'value' of 16, we must multiply the other number by 16 and add this result to the grand total. A perfectly reasonable multiplication routine can be built using this technique. However, it is easier in most circumstances to use the fact that a given multiplication will also do an arithmetic shift left in the process of doing multiplication. This is a complicated way of explaining that if you have two eight bit numbers X and Y, the multiplication process should go something like this:

- (1) The result will be stored in location Z.
- (2) Do an arithmetic shift left (*Asl* instruction) of the X byte. If the bit that falls off the end of X, ie, the bit that ends up in the carry, is set then set Z + Y.
- (3) Shift left Z and X.
- (4) Repeat the process as many times as there are bits in the two original numbers.

The following program, written in BBC Basic, shows an assembly language program to multiply two eight bit numbers together (unsigned arithmetic is used, but that's another story).

The program as presented here will not detect overflow (as in 200'200), but this is relatively easy to add. It is interesting to note that if you do decide to detect overflow, you can assume that one of the two numbers will be less than 16, since if they were both 16 or greater, overflow would be bound to result.

Thus, it would be possible to alter the range of the loop in the program to 4, but you would have to swap around the numbers N1 and N2, according to which had the top four bits set to zero, and take appropriate action if neither did.

The brackets in line 180 are necessary to prevent an obscure bug/feature in BBC Basic where if you carry out *Asl* (or *Rol*, *Ror*, etc) on a label starting with 'A', the system interprets you to be using accumulator addressing. This means that '*Asl* Ans' would be treated as '*Asl* A/NS'.

This is an extract from *The BBC Micro Compendium*, available from 1 August, from Interface Publications, 44 Earl's Court Road, London W8 6EJ.

```
>LIST
10 REM # bit binary multiplication
20
30 REM (c) 1983 Jeremy Ruston
40
50 DIM SPACE 100
60 B1=&80:REM Storage for first number
70 B2=&82:REM Storage for second number
80 AND=&82:REM Storage for answer
90 FOR LOOP=0 TO 2 STEP 2
100 PA=SPACE
110 OPT LOOP
120
130 MULTPLY
140 LDA #0 \Zero answer
150 STA ANS
160 LDX #0 \Set up loop
170 START
180 ASL (ANS) \Multiply answer
190 ASL A1 \Copy bit 7 to carry
200 BCC NO_ADD \If the bit was zero, skip addition
210 LDA A2 \Get addition factor
220 CLC \Clear carry for addition
230 ASL ANS \Add into answer
240 STA ANS \Store back to answer
250 NO_ADD
260 DEI \Check for end of loop
270 BNE START
280 RTS
290 NEXT LOOP
300
310 REPEAT
320 INPUT "Enter two numbers: "N1,N2
330 CALL MULTPLY
340 PRINT "Answer is "A:ANS
350 UNTIL FALSE
```



THE WIZARD'S WARRIORS: A fast moving game that matches developments in your skill as a player by becoming increasingly more devious. By offering to you the full range of options you can choose how to control your warrior through the maze. A full implementation of this program enables such features as a continuous series of sound effects, arcade quality graphics, double-point scoring, and-for the very artful -bonus lives.

FORTH: A full implementation. Ideal for writing fast moving arcade type games. Allows the full colour and sound facilities of the Spectrum to be used. Future Microdrive enhancements will be made available.

ADVENTURE ONE: Features a save game routine as the game can take months to complete.
"a remarkably good version...well worth the money."
...Sincier User...

MAZEMAN: A fast action m/c game that reproduces the spirit of the original.
"is very accurate and fast." ...Which Micro?

CHESS 1.4: Ten levels of play with this m/c program. Good graphic screen display.
"In a class of it's own." ...Your Computer...

INVADERS: Very fast m/c action. Includes mystery ship and increasingly difficult screens.

7 MAES AFALLEN, BOW ST., DYFED, SY24 5BA

24hr Ansaphone 0970 828851

Spectrum
£4.95



Spectrum
£4.95

ZX81 £5.95

Spectrum
£4.95

ZX81 £4.45

ZX81 £5.95

ZX81 £4.45

PROGRAMMING IN BASIC 1983

Two excellent University
taught programs for

BBC MICRO USERS

17th—22nd July

PET COMMODORE USERS

24th—29th July

Residential and non-residential

From £85.00

Details from the Business Manager
University of Manchester
Institute of Science & Technology
Sackville Street
Manchester M60 1QD

Courses suitable for teachers and school
students.

Local Authority grants may apply.

SPECTRUM Business Software

Before you buy an Apple or a Pet try one of our business programs. Our programs mean that you can now run sophisticated ledger accounting systems on your Spectrum, similar to those running on £500+ micros and sometimes costing hundreds of pounds.

Our quality programs meet all accounting and auditing requirements including full audit trail. They have the speed (maximum record search time of two seconds), the capacity (up to 1,300 entries per month) and the facilities to solve your book-keeping problems.

"On a large computer system a file of this nature would cost between £150 to £700."

Wholesalers report on our stock ledger.

48K Sales Ledger	£14.95
48K Purchase Ledger	£14.95
48K Stock Ledger and Control	£14.95
Each including manual	

KEMP LTD

43 Muswell Hill, London N10

OPEN FORUM

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Defender

on Vic20

In this game the object is to score as many points as possible and to travel as far as you can along the enemy mountains,

before you lose all your ships.

You start off with three ships. You lose a ship for crashing into the ground or into an enemy base, you can also lose a ship for running out of fuel. Your fuel supply is displayed at the bottom of the screen, when you are nearly empty there will be a

warning signal and then the last unit of fuel will flash.

You score ten points for each enemy base hit, and you gain fuel.

The controls are:

1—Up

2—Down

Cursor right—Fire

Cursor down—Bomb

The program uses high resolution graphics and is for the unexpanded Vic20. In the program there is a short machine code routine to scroll the screen from right to left.

```

8 POKE52,28:POKE56,28
12 FORA=829TO874:READB:POKEA,B:NEXTA:
  GOSUB1000
20 DATA169,19,32,210,255,169,29,32,210,255,
  169,13,32,210,255,169,0,141,60,3
30 DATA169,29,32,210,255,169,20,32,210,255,
  169,13,32,210,255,238,60,3,173,60,3
40 DATA91,21,208,231,96
41 POKE36879,8:PRINT"J":POKE36878,15:CR=64
  +128:V=30720:H=0:POKE650,128:P=36877:
  S=0:F=
42 LIVES=2:PA=10:U=0
50 POKE7878+D,0:PRINT"#####
51 IFPA=INT(PA) THENPRINT"#####
  "P:
52 IFPA<INT(PA) THENPRINT"#####
  CR=HI="HI
53 CR=ND(1):ZX=ND(1):PRINT"#####
54 POKE8164,128+6:POKE8164+1,12+128:POKE
  8164+5,5+128:POKE8164+3,12+128
55 FORSX=1TOF:POKE8164+5+5SX,128+64:NEXT
  S:POKE36877,0
60 IFCC.SANDZ=1 THENH=H+1:CHR=78:GOTO200
70 IFCC.SANDZ=0 THENX=1:Z=0:CHR=78:GOTO200
80 IFCC.SANDZ=1 THENH=H+1:CHR=77:GOTO200
90 IFCC.SANDZ=0 THENZ=1:CHR=77:X=0:GOTO200
95 IFCC.SANDZ=1 THENPOKE36876,0
100 IFCC.SANDZ=1 THENX=0:H=H+1:GOTO200
110 IFCC.SANDZ=1:Z=0:H=H+1:GOTO200
200 POKE8163-22*H,CHR+128:POKE30720+8163
  -22*H,1:IFZX,0 THENPOKE8163-22*H-22,1
201 IFU=1600 THENPOKE36869,240
202 IFU=1600 THENPRINT"#####YOU MADE IT!"
  :PRINT"#####BACK TO BASE":PRINT"WITH "S"
  POINTS"
203 IFU=1600 THENGOTO30820
207 IFU=1500 THENPOKE36879,9
208 U=U+1:SYS(829):IFH<2 THENC=6:GOTO60
215 IFH<19 THENC=4:GOTO60
220 GETA:IFR="I" THEND=D-22
230 IFR="Z" THEND=D+22
231 IFR="J" THEN2000
232 IFR="J" THEN3100
234 IFPEEK(7878+1+D)=2050RPEEK(7878+1+D)=
  2060RPEEK(7878+1+D):=1 THEN1100
240 POKE8164+4+6,32:IFR="I":1:IFF<5 THENPOKE
  36876,255:POKE36878,128
245 IFF<0 THENGOTO10100
250 IFX>1 THENX=X-1:GOTO2000
251 PA=PA-5:GOTO500
1000 FORI=7168TO7679:POKEI,PEEK(I+25600)
  :NEXT
1010 FORC=7168TO7222:READA:POKEC,A:NEXT
1020 DATA128,192,224,254,255,255,0,60,60,
  126,126,255,60,66,129,0,20,8,8,8,20,8,0
1031 DATA1,30,32,67,68,73,138,138,240,12,4,
  220,18,146,82,138,82,89,72,71,32,
  62,1
1032 DATA81,82,146,36,196,12,48,192
1035 POKE36869,255:RETURN
1100 POKE7878+D-22,3:POKE7878-21+D,4:
  POKE7878+D,5:POKE7878+D+1,6
1101 POKE7878+30720-22+D,1:POKE7878+D+30720
  -21,1
1102 POKE7878+D+30720,1:POKE7878+D+1+
  30720,1
1105 FORA=15TO0STEP-.2:POKE36878,A:POKE
  36877,200:F=15
1161 IFAC13 THENPOKE7878+D-22,32:POKE7878-
  21+D,32:POKE7878+D,32:POKE7878+D+1,32
1162 NEXTA:POKE36878,0
1500 LIVES=LIVES-1:POKE36878,15:PRINT"J"
1525 IFLIVES<0 THENGOTO3000
1530 POKE36876,0:POKE36875,0:POKE36877,
  0:GOTO500
2000 F=F-.5:FORAB=2TO15
2001 IFPEEK(7878+D+AB)<32 THENGOTO2040
2005 POKE7878+D+AB,64+128:POKE7878+D+AB-1,
  32:POKE7878+D,0:NEXTAB
2012 POKE7878+D+15,32:GOTO500
2040 IFPEEK(7878+D+AB)=77:1280RPEEK(7878+D
  +AB)=78+128 THENPOKE7878+D+AB-1,32:
  GOTO500
2045 IFPEEK(7878+D+AB)=1 THENPOKE7878+D+AB
  -1,32:GOTO2500
2050 GOTO2000
2500 IFPEEK(7878+AB+D+1)=1 THENF=F+1:S=S+10
2501 IFPEEK(7878+AB+D+23)=1 THENF=F+1:S=S+10
2502 POKEP,128:POKE7878-22+AB+D,3:POKE7878
  +AB-22+D+1,4:POKE7878+AB+D,5:POKE7878
  +AB+D+1,6
2510 POKE7878+AB+D-22,32:POKE7878+AB+D-22+1,
  32:POKE7878+AB+D,32:POKE7878+AB+D+1,32
2515 IF1=5 THENPOKE7878+D+AB+1,1:1=0
2520 S=S+10:F=F+1:POKE36876,0:GOTO500
3000 POKE36869,240:POKE36878,0
3010 PRINT"#####YOU SCORED "S" POINTS AND
  TRAVELED "1200-U" MILES SHORT OF
  THE BASE"
3011 IFD>H THENINPUT"NAME":P:HI=S
3020 RESTORE:S=0:POKE36869,255:POKE36876,0:
  POKE36875,0:GOTO12
3100 F=F-.5:FORAB=1TO22*20STEP23
3101 IFPEEK(7878+D+AB)=2060RPEEK(7878+D+AB)
  =205 THENPOKE7878+D+AB-23,32:GOTO500
3102 IFPEEK(7878+D+AB)=1 THENPOKE7878+D+AB-
  23,32:GOTO2500
3103 IFPEEK(7878+D+AB+22)=1 THENPOKE7878+D+
  AB+22,32:POKE7878+D+AB-23,32:GOTO2500
3104 IFPEEK(7878+D+AB-1)=206 THENPOKE7878+D+
  AB-23,32:GOTO500
3110 POKE7878+D+AB,2:POKE7878+D+AB-23,32:
  POKE7878+D,0
3200 NEXT:GOTO500

```

Defender

by Jonathan Thompson

Better books from Sunshine



A collection of sophisticated Basic programs and subroutines including Unifile, Renumber (handles Gotos and Gosubs) education, accounts, games and scores of essential routines. Put your Spectrum to work with what must be the most comprehensive Spectrum book. 248pp £5.95*

Some of the more advanced programs in this collection include a word processor and text editor, a music and sound synthesiser, a sprite editor and a program which allows you to enter high resolution graphics mode. This is not available in the standard Basic. 160pp £5.95*



This computer has capabilities far beyond most other computers in this price bracket. With this collection of Basic programs and routines David Lawrence introduces word processing, music and shows you how to mix text and high resolution graphics. As with the other books in this series, each program is built up out of re-usable subroutines. 160pp £5.95*



*Available through W. H. Smith's and computer dealers.

Trade/dealer enquiries welcome



SUNSHINE

Please send me

☐ The Working Spectrum at £5.95 each

☐ The Working Commodore 64 at £5.95 each

☐ The Working Dragon 32 at £5.95 each

I enclose a cheque/ postal order for £ _____ payable to **Sunshine Books** 19 Whitcomb Street, London WC2 7HF.

Name _____

Address _____

Signed _____

We can normally deliver in four to five days

DON'T MISS THIS INCREDIBLE OFFER! 50 GAMES



YES, 50 GAMES! FOR YOUR MICRO

on cassette for all the following:

SPACE ATTACK
SPACE VISION
LUNAR LANDER
T. ARRA BOLT
STARTER
RACER
LUNAR LANDING
TETRAKILL
GALACTIC SOUPFIGHT
JUDON ATTACK
FIVE-IVE ACTION
GAD
BOGGLES
PONTIAC
DAY JUMP
HANGMAN
OLD BONES
THIN ICE

SPACE RATER
GRID TIE
WOPRIDER
FOUR FIELDS
NO
TUNNEL ESCAPE
BARNEL SHIP
CARPOMBALL BATTLE
OVERLAYS
SITTING TARGET
SHOOT THE WANDER
SPACE SHIP
JET LIGHT
PHASE
ANTHUS
HAPPY
GROTES

SUBMARINES
ROCKET 1, 2, 3, 4, 5
PLANETS
BLACK HOLE
GO YOUR SHIPS
20 MAN
SPACE SEARCH
JOURNEY
WATS
PARADISE
JATROGA
HIGH WIRE
THE FORCE
EXCHANGE

sinclair SPECTRUM ZX81 LYNX DRAGON ATARI VIC-20 Apple II ION DUC & CASSETTE I ACORN-ATOM BBC A/B SHARP ORIC-1 NEW BRAIN



CASCAD SOFTWARE
CASCAD'S HOUSE
BARRAGE'S LANE
LLANDODG
SWEET
3 WALES
SPEAK

SUPPLY CASSETTE 50 FOR _____ COMPUTER
I enclose cheque/P.O.

Name _____ PCW92
Address _____

Mail order only.

ORDER NOW!

NEW


Extend the sound capabilities of your Dragon

FOR DRAGON 32

—DRAGON 32— SOUND EXTENSION MODULE

- Fully-cased Module plugs into cartridge port
- Provides 3 channels of sound: 3-note chords and harmonies over 5 octaves
- Uses new BASIC command. No need to 'Peek' or 'Poke'
- Many built-in sound effects (eg bomb, laser)
- Music and graphics can occur together without loss of speed
- Based on popular, well-proven sound generator
- Two Input/Output ports included
- User manual provided, with examples

ONLY £34.95 inclusive

Cheques/POs/  to:

**J.C.B. (MICROSYSTEMS)
29 SOUTHBOURNE ROAD
BOURNEMOUTH BH6 5AE
Tel: (0202) 423973**

Write or phone for further details

OPEN FORUM

Documentary

on Spectrum

This games program for the 16K ZX Spectrum is a spin-off of a game I saw in another magazine for the Commodore 64.

It involved shooting down three different types of dangerous 'space waste' which constantly fall towards your planet under its gravitational pull.

You must shoot down this waste before it reaches your planet and reduces your population.

The waste takes on the form of three different shapes; the first is a runaway bomb which will take out 250 people, so is only worth 10 points. The second is an old space ship rolling through space, if hit it is worth 20 points and will kill 500 people. The final piece is an anti-matter crystal which could kill 750 people, but is worth only 30 points.

At the start of the game you are given two laser bolts and two each time you hit a piece of waste.

Program notes

Lines 80-130 Move your spacecraft and check if you

200-280 are dead
30-310 Fire your laser bolts
800-830 Blow up the waste
900-910 Reduce lives
900-910 Initialise and categorise type of waste
1000-1040 Move the waste — this is the main part of the game
1050-1060 The waste has reached your planet
9000-9100 Set UDG, initialise variables, set up screen
9900- You have been blown up three times, 'PRINT' insults, end game
Graphics
Line: 'L'
100 'ABCD', 'EFGH', 'IJK'
9900

PROGRAM OF THE WEEK

```
1 FIRST SHOT IS IMPORTANT....."
2 PAUSE 100
3 INK 7: PAPER 0: BRIGHT 1: B
4 ORDER 0: CLS
5 GO TO 1000
6 IF ATTA (x,y+1) < 63 THEN GO
  TO 800
7 LET y=y+(INKEY$="2" AND y<2)
8 -INKEY$="1" AND y>1: PRINT A
  T y
9 IF INKEY$=" " THEN GO SUB 2
10 RETURN
11 IF shs=0 THEN RETURN
12 LET shs=shs-1
13 LET sho=(y+2)*8+5
14 PLOT sho,32
15 DRAW OVER 1:0,130
16 BEEP .21,30
17 PLOT OVER 1:sho,162: DRAW O
  VER 1:0,-130
18 IF SCREEN$(y,y+1)="" AND y
  < 15 THEN GO TO 300
19 RETURN
20 FOR w=5 TO -5 STEP -1: BEEP
  .01,w: PRINT AT y,y+1: OVER 1:C
  HR$(RAND*30+32): NEXT w: PRINT A
  T y,y+1
21 LET shs=shs+2
22 LET sc=sc+(c*10): GO TO 900
23 FOR g=40 TO 0 STEP -5: BEEP
  .08,g: NEXT g: PRINT AT x,y:
  "LET lives=lives-1. IF lives=
  0 THEN GO TO 9900
24 PRINT AT 18,yy: "AT 19,yy
  ;"
25 PRINT AT 0,20: "PRINT
  AT 0,28: FOR d=1 TO lives: PRI
  NT INVERSE 1;"d": NEXT d
26 PRINT AT 0,30: INVERSE 1;"
  "
27 IF c=3 THEN LET c=0
28 LET c=c+1: LET x$=a$(c): LE
  T yy=RND*27+2
29 PRINT AT 0,0: "
30 FOR g=2 TO 20
31 IF pop<0 THEN GO TO 9900
32 PRINT AT 0,2: INVERSE 1;"Sc
  ore ";sc:AT 0,12: population ";p
  op
33 LET f=f+1
34 IF f=5 THEN LET f=1
35 PRINT OVER 1:AT 9,yy: BRIGHT
  0;x$(f): BRIGHT 0:AT 9-1,yy;x$
  (f)
36 IF g=2 THEN PRINT AT 1,yy;"
37 LET f1=f
38 GO SUB 80
39 NEXT g
40 LET pop=pop-c*250
41 BEEP 8:pop: RESTORE : FOR
  p=0 TO 12: READ ww,www: BEEP ww/
  750,www/10: NEXT p
42 PRINT AT 20,yy: OVER 1;x$(f
  )
```

```
1000 GO TO 900
1001 REM *****
1002 FOR g=32600 TO USA "I"+7
1003 READ s: POKE g,s: NEXT g
1004 DATA 1,17,243,150,158,136,
  246,9,16,51,17,243,150,158,136,
  6,136,189,249,17,17,31,8,8,8,1
  6,16,16,16
1005 DATA 24,255,126,60,24,24,24
  ,0,0,1,255,120,0,0,0,24,24,2
  4,6,0,126,255,24,0,0,0,126,255,1
  0,0
1006 DATA 126,70,74,82,98,126,0,
  0,16,56,84,146,84,56,16,0,126,98
  ,82,74,70,126,0,0
1007 DATA 16,16,56,106,254,186,5
  6,254
1008 DIM a$(3,4)
1009 LET pop=5000
1010 PLOT 0,0: DRAW 255,0,-13
1011 LET lives=3
1012 LET shs=2
1013 LET a$(1)="010": LET a$(2)
  ="14": LET a$(3)="0000"
1014 LET c=1: LET x$=a$(c)
1015 LET yy=RND*27+2: LET x=18:
  LET y=13
1016 LET sc=0: LET h=1000
1017 LET lives=3
1018 PRINT AT 0,0: INVERSE 1;"
1019 PLOT 0,0: DRAW 255,0: DRAW
  0,175: PLOT 0,0: DRAW 0,175
1020 LET f1=1
1021 FOR d=1 TO lives: PRINT AT
  0,26+d;"d": NEXT d
1022 LET f1=f
1023 RETURN
1024 LET x$=a$(3): FOR g=0 TO 10
  0: PLOT x,20: DRAW AND#23,g: PLO
  T x,20: DRAW -AND#23,g: NEXT g
1025 PRINT AT 3,1:"YOU HAVE LET
  THE SPACE-WASTE:" DESTROY
  YOUR PLANET"" YOU HAVE 5
  CORES"
1026 IF pop<2500 AND pop>0 THEN
  PRINT "YOUR POPULATION HAS BEE
  N GREATLY"" DECREASED,BUT THEY
  HAVE ALL"" EVACUATED SAFE
  LY"
1027 IF pop<2500 THEN PRINT ""
  POPULATION IS NEARLY INTACT""
  BUT EVACUATION WAS SLOW""
  YOU MAY HOLD YOURSELF""
  RESPONSIBLE"
1028 IF pop>0 THEN PRINT "" YO
  U ARE RESPONSIBLE FOR THE"" D
  EATHS OF 5000 INHABITANTS""
  OF YOUR HOME PLANET""
1029 FOR g=0 TO 2500: IF INKEY$=
  "" THEN NEXT g
1030 RUN
```

SPACE-WASTE @ D.J.P. 1982

Documentary
by David Parkinson

Globe

on BBC

This program can be used to draw a planet in space and then to create the illusion of rotation. This is done in several procedures:

- Procstars* — Plots 100 stars in random positions in space.
- Proccplanet* — Draws in the background.
- Proclongitude* — Draws lines of 'longi-

Procring

Proccrotate

Fnk and Fny

tude' in colours 7-15 on the planet's background.

- Draws a ring around the planet.
- Changes the 'actual colours' of the longitude lines in sequence to produce the impression of rotation.
- Offsets the planet's axis. (See below).

To save time the sine and cosine values are stored in arrays in lines 40 — 100 so that they will not have to be calculated more than once in the program; this means that there will be a pause when the program is run so do not be alarmed! To make the planet look more realistic the two functions at the end of the program are used to make it seem as though it is revolving about a non-horizontal axis.

```

:VDU1,27,1,81  GLOBE (c) 1983
XL
10  REMOVE THESE BUT
20  REMEMBER JAMES JACKSON'S
30  MODE2
40  DIM S(99),C(99)
50  A0=1
60  R0=400
70  FOR A=0 TO 360 STEP 10
80  A0=A+1
90  S(A0)=SIN(A):C(A0)=COS(A)
100 NEXT
110 VDU29,8202,0,0;
120 VDU19,0,4,0;
130 VDU19,4,7,0;
140 VDU19,7,0,0;
150 PROCSTARS
160 PROCCPLANET
170 PROCLONGITUDE
180 PROCRING
190 REPEAT
200 PROCCROTATE
210 UNTIL FALSE
220
230 DEF PROCSTARS
240 GCOL 8,3
250 FOR T=0 TO 100
260 PLOT 69,RND(1279),RND(1023)
270 NEXT
280 ENDPROC
290
300 DEF PROCCPLANET
310 VDU29,440,512;
320 GCOL 8,2
330 MOVE 0,0
340 FOR A0=0 TO 90 STEP 2
350 MOVE 0,0
360 PLOT 85,S(A0)*R0,C(A0)*R0
370 NEXT
380 ENDPROC
390
400 DEF PROCLONGITUDE

```

```

410 C0=6
420 FOR L0=0 TO 45
430 C=C0+1
440 IF C=16 THEN C=7
450 GCOL 8,C0
460 FOR A0=0 TO 45 STEP 3
470 X=S(A0)*C:(L0)*R0
480 Y=C(A0)*R0
490 IF A0 THEN K0=5 ELSE K0=4
500 PLOT K0,FX,FY
510 NEXT
520 NEXT
530 ENDPROC
540
550 DEF PROCRING
560 GCOL 8,4
570 FOR R0=500 TO 572 STEP 8
580 FOR R0=36 TO 99 STEP 3
590 A0=R0 MOD 90
600 IF R0=36 THEN K0=4 ELSE K0=5
610 X=C(A0)*R0
620 Y=S(A0)*R0
630 PLOT K0,FX,FY
640 NEXT
650 NEXT
660 ENDPROC
670
680 DEF PROCCROTATE
690 FOR C0=7 TO 15
700 VDU 19,C0,7,0;
710 WAIT=INKEY(10)
720 VDU 19,C0,2,0;
730 NEXT
740 ENDPROC
750
760 DEFRN0=(8.900)*(-0.48Y)
770 DEFRN1=(8.400)*(-0.90Y)

```

Globe

by James Jackson

Break the Code

on Vic20

This is a version of the 'Mastermind' game with a slight difference. Not only must you guess the colour combination within 10 moves but also within a time-limit.

There are four levels of play, 4 being the

easiest. To make the game easier or harder just change the times in lines 620-650. To input your choice use the colour keys, cyan and blue are not used in the game. After you have put in your guess you will have a chance to change it.

The Computers response to your guess is as follows: For every black square you have a correct colour in the right place, for

every white square you have a correct colour in the wrong place.

Program notes

- 10 Re-seeds random generator
- 110-140 Computer picks code
- 180-340 Input guess
- 350-390 Checks choice against code
- 500 Times up
- 530-540 Music routine if right or wrong
- 600-650 Time-limit routine

```

10 L=RND(-TI)
20 C=7732:D=7690:G=7741:J=30720:K=7734
30 M=36878:N=36876:O=36874:KK=36877:RR=0
40 POKE36879,59:PRINT"J"
50 PRINT"XXXXXXXXX BREAK THE CODE!"
60 PRINT"XXXXXXXXX BY KEN ADAMS"
70 PRINT"XXXXXXXXX PRESS SPACE"
80 GETG$:IF G$<>" " THEN 80

```

```

90 PRINT"XXXXXXXXX INPUT LEVEL (4-1)"
100 GOSUB600
110 PRINT"J":FOR I=0 TO 3
120 A(I)=INT(RND(1)*16)
130 IF A(I)=3 OR A(I)=6 THEN 120
140 NEXT
150 FOR I=0 TO 6:POKE I+1,0:POKE I+J,2:NEXT
160 T1$="000000":FOR I=48 TO 57:POKE I,C:C=C+44:NEXT

```



```

170 PRINT"TIME "RIGHT$(TI$,3):IFTI$=B$THEN500
180 R=0:W=0:FORI=0TO3
190 GETC$(1):U(I)=VAL(C$(I))-1:PRINT"TIME
"RIGHT$(TI$,3)
200 IFTI$=B$THEN500
210 IFC$(1)="0"THENN250
220 IFU(I)=-1THEN190
230 IFU(I)>7ORU(I)<0ORU(I)=30RU(I)=6THEN250
240 GOTO260
250 PRINT"*****ERROR":FORT=0TO750:NEXT:PRINT"
":GOTO190
260 POKEM,15:POKEN,203:FORT=0TO10:NEXT:POKEN,0
270 POKEK,81:POKEK+J,U(I):K=K+2:NEXT
280 PRINT"*****OK?":PRINT"Y/N"
290 GETG$:PRINT"TIME "RIGHT$(TI$,3):IFTI$=
B$THEN500
300 IFG$="Y"THEN350
310 IFG$="N"THEN290
320 PRINT"*****":PRINT" "
330 FORT=0TO5:POKEK+T-8,32:NEXT:K=K-8
340 POKEM,7:POKEK,203:FORT=0TO100:NEXT:POKEK,
0:GOTO170
350 FORP=0TO3:X(P)=A(P):NEXT
360 FORT=0TO3:IFU(I)=X(I)THENR=R+1:X(I)=20
:U(I)=10
370 NEXT
380 FORT=0TO3:FORZ=0TO3:IFU(I)<X(Z)THENNEXTZ:
NEXTI:GOTO400
390 W=W+1:X(Z)=20:NEXTI
400 IFR=4THEN510
410 IFR=0ANDW=0THENPOKEG+1,14:POKEG+2,15:POKEG+3
,14:POKEG+4,5:FORT=1TO4:POKEG+I+
J,2:NEXT
420 IFR=0THEN440

```

```

430 FORT=1TOR:POKEG+T,123:POKEG+T+J,0:POKEG,196:
FORL=0TO5:NEXT:POKEG,0:NEXT
440 IFW=0THEN460
450 FORT=1TOR:POKEG+T+R,123:POKEG+T+R+J,1:POKEG,
182:FORT=0TO5:NEXT:POKEG,0:NEXT
460 K=K+36:G=0+44
470 IFTI$=B$THEN500
480 IFK<8164THENRR=1:GOTO510
490 PRINT"*****":PRINT" "GOTO170
500 PRINT"TIMES UP":RR=1
510 FORT=0TO3:POKEG,81:POKEG+J,A(I):POKEG+1,32:
D=D+2:NEXT
520 IFR<0THEN540
530 FORT=255TO128STEP-1:POKEG,10:POKEG,I:FORT=
0TO5:NEXT:NEXT:POKEG,0:GOTO550
540 FORT=128TO255:POKEG,10:POKEG,I:FORT=0TO5:
NEXT:NEXT:POKEG,0
550 PRINT"*****ANYMORE?
(Y/N)":
560 GETG$:IFG$="Y"THEN10
570 IFG$="N"THEN560
580 PRINT"J":END
600 GETL$:B=VAL(L$):ONB00T0620,630,640,650
610 GOTO600
620 B$="000230":RETURN
630 B$="000300":RETURN
640 B$="000400":RETURN
650 B$="000500":RETURN

```

Break the Code
by Ken Adrians

Left-handed

on Spectrum

This is a machine code routine for the ZX Spectrum. The idea came to me when I had injured my left hand, and was forced to use the keyboard one handed. I discovered that I could not use 'delete' — the

shift and zero keys were too far apart. This routine allows you to use the Symbol shift and zero keys instead — much more simple. The idea could be extended; the same method could be used to redefine the *Edit* key as Enter, and make your programs uneditable.

An assembly listing is included so you can experiment with it; it was entered on

the Bug-Byte Aspect assembler, so if you own this program you can type the listing in straight away.

Please note that this 'single handed Delete' uses the interrupts on the 48K Spectrum. To use the routine on a 16K machine, change the second byte of code from 9 to 40, the 65120 to 32339, and the 65158 to 32377.

```

5 CLEAR 32377
10 FOR g=65120 TO 65158: READ
a: POKE g,a: NEXT g
15 DATA 62,20,237,71,237,94,
201,0,0,255,243,245,
220,33,8,252,126,4,54,
95,40,6,254,10,40,
9,225,241,251,201,62,
12,119,24,247,62,95,
119,24,242

```

'PRINT USA 65120' ACTIVATES THE
ROUTINE 32377

```

0001 ORG 65120
0002 LOAD 65120
0003 LD A,9
0004 LD I,A
0005 IM 2
0006 RET
0007 ORG 65129
0008 LOAD 65129
0009 RST 56
0010 DI
0011 PUSH AF
0012 PUSH HL
0013 LD HL,23560
0014 LD A,(HL)
0015 CP 95
0016 JR Z,A1
0017 CP 12
0018 JR Z,B1
0019 C1:POP HL
0020 POP AF
0021 EI
0022 RET
0023 A1:LD A,12
0024 LD (HL),A
0025 JR C1
0026 B1:LD A,95
0027 LD (HL),A
0028 JR C1
0029 END

```

Left-handed
by Bill Longley

HORNET

SOFTWARE LTD

FOR THE
DRAGON 32 & TSR80 CO-CO

A BRAND NEW MACHINE
CODE GAME IN THE UK

WORMTUBE
FROM ZETA

1 to 4 players — 9 speed/skill levels — Joystick Control —
Pause Control — Arcade style action and sound —
Wormtube has Rainbow certification seal and was
reviewed in March 83 *Rainbow* as a well-conceived game
with great graphics and strong sound effects

£8.00

HORNET SOFTWARE LTD

**10 BUCKINGHAM'S WAY, SHARNFORD
LEICS, LE10 3PX. TEL: 0455 272037**

MORE GAMES TO BE RELEASED SOON

TRADE ENQUIRIES WELCOME

GOOD ROYALTIES PAID FOR DRAGON M/C
SOFTWARE

DRAGON SOFTWARE all machine code

BOMBA

Addictive Arcade style game in full colour.
Climb the ladders and dig holes to trap the
"Meemes" before they kill you. 4 selectable
speeds and choice of 1 to 9 meemes to start.
NO JOYSTICKS NEEDED
SUPPLIED ON CASSETTE

£7.95

DGT2

Three Fast-moving Arcade style games in
full colour, with Hi-Res graphics and sound.
Very addictive — any single one of these is
worth a fiver, so £6.95 for all 3 is a bargain
(from PCW review) SNAKES, LANGER &
INVADERS (No joystick)
3 ON ONE CASSETTE

£6.95

EDITOR ASSEMBLER — MONITOR

Two Pass Global type. Supports standard
Motorola mnemonics and Addressing modes.
Powerful Debug Monitor. Recommended for
the serious user.
SUPPLIED ON CASSETTE WITH USER
INFORMATION

£28.75

DISASSEMBLER

Written in position Independent Machine
Code, will run anywhere in RAM. The ideal
tool to have around.
SOLD ON CASSETTE

£11.85

SPECIAL OFFER

Buy Editor Assembler and Disassembler
together and save £5.00
Cost of both as one purchase

£35.00

Cheques/POs payable to
J. MORRISON (MICROS) LTD
(Dept DU1)
2 Glenade Street, Leeds LS9 9JZ
Tel: (0532) 490897
ALL ORDERS DESPATCHED BY
RETURN FIRST CLASS POST
Callers and Trade enquiries welcome

DROIDS — NEW (OPTIONAL JOYSTICK)

Stop the Droids removing lead shields to
release the bombs. Will be the
world's very fast game. Excellent Hi-Res
colour graphics and sound.
SUPPLIED ON CASSETTE

£5.95

CHESS

Hi-Res display of board and pieces. 8 select-
able levels of skill. CURSOR Control move
selection (No numbers letters to enter).
Supports CASTLING AND EN PASSANT.
SUPPLIED ON CASSETTE

£7.95

VULTURES — NEW (uses one joystick)

Fast Moving GALAXIAN TYPE GAME in full
colour with Hi-Res graphics and sound. A
flock of vultures guard their eggs. As they
swoop towards you try to kill them, but watch
out. Just when you think you have killed them
all, the eggs hatch!
SUPPLIED ON CASSETTE

£6.95



J. MORRISON (MICROS)

**NOW YOU CAN LIFT STATIC DRAWINGS, PHOTOGRAPHS, ETC. RIGHT OFF
THE PAPER AND BRING THEM TO LIFE INTO YOUR PROGRAM!**

TWO POTENT FEATURES COMBINE TO BRING YOU UNIQUE NEW POWER OVER YOUR SPECTRUM GRAPHICS!

FROM PAPER TO SCREEN...
...AND INTO YOUR PROGRAM.

POWER GRAPHICS

ACTION-TRACER + GHOST-WRITER
IMAGE-TRANSFER SYSTEM PROGRAM COMPILER

ACTION-TRACER Gives you the power to transfer
line drawings, photographs, paint-
ings, lettering — in fact ANY paper-based images into full colour
line-drawings on your Spectrum screen, with astonishing ease and an
accuracy that rivals expressive digital tracing. But this time you get more
than just a static on-screen design that has to be laboriously drawn on
and off tape, because...

GHOST-WRITER Interprets your on-screen de-
sign into the precise sequence
or basic instructions needed to EXACTLY reproduce it, and then writes the
program for you, directly into memory! New program lines appear in your
listing which are indistinguishable from ones you might have written
yourself. When you've finished, POWER-Graphics will 'self-destruct',
leaving behind only your new program lines ready to use.

TOGETHER THEY'RE DYNAMIC!

The new program captures your design DYNAMICALLY, giving you
instantly the power to MOVE it anywhere, to SHRINK it down to a single
pixel, or EXPAND it to fill the screen. You can SQUEEZE or STRETCH it into
wild distortions. Flip it UPSIDE DOWN or MIRROR-IMAGE it. ROTATE it
the plane of the screen... in other words MANIPULATE IT UNDER YOUR
FULL CONTROL!

Over GHOST-WRITER has captured Space-Shuttles, you can im-
mediately reproduce it anywhere, any size. And redesign it fast!

No program producing mirror-images and turning them upside-down is just as
easy, too!

Drawing a simple cross-section (show any and
every architecture in just a few lines) is a whole new
ABC by GHOST-WRITER's versatile programming.

INSTANT FORGOT!
How would you like to write a program that
signs your name exactly as you do yours?

It's just a few minutes fun with POWER-
GRAPHICS!

**MANIPULATION OR ANIMATION: GHOST-WRITER ALWAYS WRITES
EXACTLY THE PROGRAM YOU NEED!**
You can tell GHOST-WRITER to program selected parts of your design
with their own special line numbers, allowing you to call them as
separate sub-routines. Thus you can add or remove parts at will — like
the Business bureau in this chemistry diagram.

Annotating the tips of the well-known newswriter (recognize her?) is just as
simple — and thanks to POWER-Graphics' ability to produce high speed curves
when needed (which draw as fast as straight lines) can be animated in
real time!
POWER-Graphics is fun to use, simple in programming, and for beginners and
advanced users alike is an important new programming tool that extends the
Spectrum's potential for imaginative graphics into exciting new regions.
IF YOU WANT PICTURES YOU CAN USE, IT HAS TO BE POWER-Graphics.

BUTTERCRAFT SOFTWARE

14 Western Avenue, Riddlesden, Keighley, Yorks. ENGLAND
PLEASE ASK FOR OUR ILLUSTRATED LIST OF GUARANTEED-QUALITY TRS80/VIDEO GENIE SOFTWARE

ZX SPECTRUM
FOR 16K OR 48K
ONLY £8.95

OVERSEAS
CUSTOMERS
ADD £1.00
EXCESS POSTAGE

OPEN FORUM

Snoopy

on ZX81

For all of you with ZX printers, here is a

program to utilise them and set pleasing results. If necessary, a small message could be added in line 165. The program

could be converted for the Vic20 by removing the 'L's from Lprint, and adding:

```
6 OPEN1:4:CMD1
169 PRINT#1:CLOSE1
```

```
5 REM SNOOPY PRINT
```

```
10 LPRINT "
```

```
20 LPRINT "
```

```
30 LPRINT "
```

```
40 LPRINT "
```

```
50 LPRINT "
```

```
60 LPRINT "
```

```
70 LPRINT "
```

```
80 LPRINT "
```

```
90 LPRINT "
```

```
100 LPRINT "
```

```
110 LPRINT "
```

```
120 LPRINT "
```

```
130 LPRINT "
```

```
140 LPRINT "
```

```
150 LPRINT "
```

```
160 LPRINT "
```

```
170 END
```

```

      +*+*+
      ' ' ' ' ' '
      ( @ @ ' --- "
      / *
      /** *
      *++*+
      +*+*+
      +*+*+ /--- *
      ' * ' ) /
      A+A"
      ) '
      ' ) "
      + ) I /
      --( I I ---, --, "
      ( ++ ( - ( ) ) + ) "
      ' ' ZZ' *---*"
```

Snoopy
by M Valentine

INTERSOFT SOFTWARE

The logical choice

"KILBIRNIE", LONMAY, FRASERBURGH, ABERDEEN
03463 2683

CHAIN REACTION for Dragon 32 or 16K and 48K Spectrum

The strategy of chess, the simplicity of draughts. A new exciting two-player board game. Play your friend or your micro..... **£7.00**

SMUGGLERS' ISLAND for Oric-1

A new 48K Oric adventure. The one you won't crack in a month. Easy to start — hard to finish..... **£7.00**

Also available:

DARE DEVIL PILOT for Dragon 32

More than a flight simulator — more than a game... it's both..... **£7.00**

GRANDAD'S WILL for Dragon 32

A black-humoured adventure. Find the will before greedy Broderick..... **£4.50**

SUPATREK for 16K or 48K Spectrum

With eight extra functions. This really is a "Supa" trek game..... **£7.00**

All prices include postage, etc., please send cheques/POs to:

INTERSOFT, "KILBIRNIE", LONMAY, FRASERBURGH, SCOTLAND

SINCLAIR OWNERS READ THIS FROM OCF

You're probably hearing about MICROME, COULD, MICROWARE and THOUGHTS... to what? How can they help me?

Well now you can find out and take the very real difference by purchasing our latest MACHINE CODED programs. These emulate features of the most modern professional computers (12 years' writing machine code programs for IBM, ICL, UNIVAC and Sinclair means we know what we're talking about).

Just read the specifications and you'll see what we mean.

MACHINE CODE TEST TOOL

The ultimate professional tutor and debug program, we wrote this to help us write our own programs.

- **TEXT** and display machine code instructions as they're written
- **IDEAL** for both the novice and the expert
- **FULLY** documented with a 12 page manual
- **PRECEDENTIAL** conversion as standard
- **CHARACTER GENERATOR** - of unbelievable quality

Supplied free with the Spectrum version

Available for the IBM Z801 and 1048K Spectrum

SPECTRUM CHESS™ Dare you Face The Turk

The original Turk with an ingenious sensory system, a three mechanical figure representing in Turkish costume and seated behind a wooden cabinet on which a chess board and pawns were placed.

OCF now offers you the extremely unique system of that Turk - a chess playing computer program.

The Turk challenges you to a game of chess

MANY OPTIONS INCLUDE:

- 8 LEVELS OF DIFFICULTY
- DEMONSTRATION MODE
- BOARD EDITOR
- GAMES REVIEW FACILITY
- BOTS CHALLENGE THE CLOCK
- TWO PLAYER MODE
- UNFINISHED GAMES CAN BE STORED
- RECOMMENDED MOVES
- FULL INSTRUCTIONS PROVIDED



ADDRESS MANAGER.....

Works on the IBM and 48K Spectrum, on 48K it will store, file, select and retrieve over 400 full addresses (over 1300 individual names). Dynamic Memory Management and compression techniques makes it all possible and there's a 32 page manual.

• **FULL SCREEN INPUT AND EDITING** - see it as a page as it happens with insert, delete and TAB commands.

• **MULTIPLE INDEXING** - 3 ways can define index enables you to define, catalogue, select and print names in instant (essential for the more sophisticated applications).

• **INSTANT RESPONSE** - yes, the program is very very fast.

• **SUPER FRIENDLY** - (unfriendly) extremely easy to use and efficient in a way that BASIC can never be.

• **MANY USES** - keeping addresses, printing out Names Card lists etc.

• **AT HOME** - keeping addresses, printing out Names Card lists etc.

• **AT WORK** - for multistep work, internal telephone directory, sorting customers into types, areas, size, etc.

• **CLUBS** - print-out members list, sort different categories etc.

MACHINE CODE...IT MAKES ALL THE DIFFERENCE....

For order to OCF Computer Publishing Ltd, 170, Box 99, Centre

These include: **Address Manager** at £8.95 each - Spectrum only

Chess The Turk at £9.95 each - Spectrum only

Machine Code Test Tool at £9.95 each

Look for the edition required - Z801 Spectrum

Send cheque, postal order or ACCESS No. to above address. Or telephone order with ACCESS No. to 0273 888866.

NAME _____

ADDRESS _____

POSTCODE _____

Available from most branches of W H SMITH and other retailers.

OCF

GAMES CENTRE

THE LARGEST SELECTION
OF GAMES IN THE WORLD

We stock the BIG NAMES
in Computers including

ATARI 400/800
SINCLAIR ZX 81
ZX SPECTRUM

and a wide range of
independent
SOFTWARE

Main Computer Branches:

22 OXFORD STREET, London W.1.
439 OXFORD STREET, London W.1.
52 WESTERN ROAD, BRIGHTON.
31 LISTER GATE, NOTTINGHAM
141 NEW STREET, BIRMINGHAM

Also at:

184 REGENT STREET, London W.1.
254 REGENT STREET, London W.1.

VC-20

MY BOYS
COULD 'BYTE'
THROUGH ANYTHING...
UNTIL THESE
CAME ALONG!!

E49-99

(INCLUSIVE)

32K RAM PACK

VIC 20

'GEMINI'
SOFTWARE

1- DATA BAS

2- STOCK CONTR

3- MAILING LI

4- INVOICE/STAT

5- HOME ACCOUN

6- COMMERCIAL A

Name _____

Address _____

Please send me ☐ 32K RAM PACKS @ £119.99

Software Number ☐ 32K RAM PACK @ £59.99

I enclose cheque / PO for £ _____

SEND TO: PLUS 80 LTD

No Stamp Needed) FREEPOST

NARROW

MIDDLESEX HA2 0BR

21-423-6393

*2859 bytes

*Allow 7 days

Tony Bridge's Adventure Corner



Summer games!

By the time you read this, many of you will have finished your exams — you lucky devils! So, you will now be crawling back into the daylight and looking for a good adventure program to keep you amused throughout the summer months. To bring you up-to-date with what the rest of the world has been up to lately, here are my personal top adventures:

- (1) *The Hobbit* — for changing, overnight, the face of Spectrum adventuring, Melbourne House, the publisher of this by-now classic game, should rectify some of the irritating little bugs in the program, which they must be well aware of by now. More importantly, versions for the other popular micros should be released — they can't lose!
- (2) *The Scott Adams Adventure Series* — for the Vic20, Texas, and other machines. There is the Willie Crowther/Don Woods classic for mainframe computers, but this series is the classic for home micros. Set purely in text, they pose good problems, with a high degree of difficulty, all set in an imaginative scenario. Titles include: *Voodoo Castle*, *Strange Odyssey*, and *The Count*.
- (3) *The Level 9 trio* — *Colossal Adventure*, *Adventure Quest* and *Dungeon Adventure*. The first of these is a version of the Crowther/Woods original, but with a much-expanded endgame. The other two start from locations within the first, thus making an impressive suite of adventures. They are always a pleasure to play, not least because of the comprehensive and well-produced documentation, which even include a SAE, which you may use to ask for *Help* in desperation.
- (4) *Pirmania*, from Automata — not one of my personal favourites (I don't think the humour of their lovely adverts translates well to the micro adventure), this program nevertheless deserves a place in this survey because it introduced the idea of a prize for the first person to crack the puzzles of the game. *Pirmania's* Golden Sundial thus follows the book world's Golden Rabbit from *Masquerade* into the history books. And nobody's found it yet!

- (5) *Madness and the Minotaur* — from Dragon Data, for the Dragon. It's here because, after *The Hobbit* and the *Scott Adams* series, this is the one I've had most enquiries about. While difficulty is not the ultimate criterion of a good adventure, this one, as Michael Vesey of Worktop can verify, is crackable. He has written asking what all the fuss is about, as he has no problem in finding the mushroom.
- (6) Just about any adventure for the Atari machines. There are not many text programs, and those available are fairly standard, but, in keeping with the Atari's graphic capabilities, the arcade adventures are really special, and can be highly recommended. Representative are *Ghost Encounters*, *The Pharaoh's Curse*, *Action Quest* and *Journey to the Planets*.
- (7) *Artic Adventures A-E* — these are all of a similar format, pure text, unblemished by graphics. I get many letters asking for help with these programs, and while difficulty may not be the prerequisite of a good adventure, these games are extremely compelling.
- (8) Last, but not least, is a graphic adventure that I come back to again and again — *Volcanic Dungeon* from Carnell. Available for the ZX81 and the Spectrum, this has good documentation, which includes a map of the dungeon. Combining elements of *D* &

D and the old favourite *Wumpus*, it can be played again and again.

So, there is a quick survey of programs that you are likely to enjoy. But, please write and let me know of your own particular favourites.

Now, a hopeful look forward to packages we would all like to see! First off — *Lord of the Rings*, from Melbourne House, all 89 parts of it. I don't know the legal aspect of this, but if MH have the rights, they must surely be working on the epic.

Then, *Artic's Adventure F* — and please, *Artic*, how about just a touch of colour? And, while we're about it, how about versions for other micros?

Finally, *Valhalla*, from Micro! — a program that, according to the publisher, will knock *The Hobbit* from its pride of place. The graphics and game mechanics are, apparently, superb.

NB: All entries for the Adventure Competition must reach us by 30 June.

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, *Popular Computing Weekly*, Hobbhouse Court, 19 Whitcomb Street, London WC2 7HF.

Cruising & Blind Alley

£10 to be won
Cruising

Can you beat the new high score?

First there was *Space Invaders*, then there was *Pacman* — now there is *Cruising*. This all-action, machine code, arcade type game, will test your powers of co-ordination to the limit. Never before has a game asked you to think so quickly, or move so fast.

Achieving a high score on *Cruising* takes considerable skill, and not a little patience.

Popular Computing Weekly is offering £10 each month to the player with the highest score on *Cruising*. All you have to do to enter this month's competition is send a print-out of your highest score, together with your name and address, to:

Popular Computing Weekly
Cruising
Hobbhouse Court
19 Whitcomb Street
London WC2 7HF

Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* challenge?

The winner of last month's competition with a score of 22664 was I. C. Willis of Shore Lane, Sheffield, who receives £10. Entries for this month's competition close on June 30.

Notes

- 1) Each entry must consist of a ZX printout and your name and address.

- 2) Closing date for this month's *Cruising* challenge entries is June 30.
- 3) The highest score each month will receive £10.
- 4) High scores cannot be transferred from one month to another.
- 5) The judges' decision is final.
- 6) No employees of Sunshine Publications Ltd. or their families, will be eligible to enter.

Blind Alley

Blind Alley is a game of strategy. In order to win you must outwit the computer, using your craft to fence in and finally destroy the enemy pursuit vehicles. But, watch out for the solid trail left by your opponents — one touch is fatal!

Each month *Popular Computing Weekly* is giving away £10 to the player with the highest score on *Blind Alley*. To enter this month's competition simply send in a copy of your score and the code at the bottom of the score table, together with your name and address to:

Popular Computing Weekly
Blind Alley
Hobbhouse Court
19 Whitcomb Street
London WC2 7HF

The highest score sent in so far this month is 70625 from Stuart Williamson of Bradford, West Yorks. Entries for this month's competition close on June 30.

ATOM EXTENSIONS

2K STATIC RAM. Easily fitted inside the Atom. No soldering. Occupies empty space from #9800 to #9FFF. Uncorrupted by Operating System so ideal for machine code routines. Outside VDG buffers so no interference with display.
Only £12.00 + VAT UK p&p FREE. Cheque with order please.

CLARE EXTENSION SYSTEM Available soon!

A complete system for the Atom which will include:
8K CMOS RAM + 8K ROM sockets proposed price £50.00 + VAT
EPROM PROGRAMMER proposed price £35.00 + VAT
16K EPROM module proposed price £27.50 + VAT
PSU Battery backed 5V + 5V + 25V proposed price £24.00 + VAT
16K CMOS RAM
Send for further details.

Enquiries and Orders to:

CLARE COMPUTER COMPONENTS
46 BATH ROAD, STROUD, GLOS, GL5 3JL

EMPIRE

- The latest strategy game for the **DRAGON 32**
- Destroy the **EVIL DRAGON EMPIRE** before it conquers the world!
- Includes seven world maps and on-screen scoring
- 100% high resolution with machine code
- Eight levels of difficulty
- For one player (**NO JOYSTICK NEEDED**)
- Suitable for all ages

Send cheque/PO for **£6.95** to:

SHARDS SOFTWARE
10 Park Vale Court, Vine Way, Brentwood, Essex
CM14 4UR

BOND SYSTEMS

TOUCH TYPING with a new, simple finger position system gives "peek and peck" programmers new speed and accuracy. Your computer can type up to 100 words per minute with this course! Can you? **DRAGON** keyboard is ideal for this course. **SPECTRUM** has non-standard positions for space-bar and "'", but otherwise ideal.

VOCAB FRENCH and **VOCAB GERMAN** present a 700 word vocabulary of your most needed words straight into your "memory".

Write to **BOND SYSTEMS**, stating **DRAGON** or **SPECTRUM** and **PROGRAM NAME**, with £5.00 for each program.

15 BELMONT ROAD, HARROGATE, NORTH YORKSHIRE, HG2 0LR

ATTENTION ALL SPECTRUM USERS — BASIC TRACE —

A 760 byte machine code routine which intercepts each BASIC Statement prior to execution, displaying the line number, statement number, and the statement itself in the lower screen area.

● FEATURES INCLUDE:—

- Single step or continuous program execution.
- Trace listings to ZX Printer if required.
- No corruption of upper screen display
- TRACE ON and OFF at will.
- 16K and 48K versions on same cassette.

- ALL THIS FOR ONLY **£6.95** INCLUDING P & P FROM: ●

Texgate Computers Ltd.
14 Brook Lane, Corfe Mullen, Dorset BH21 3RD

SALE P.&R. COMPUTER SHOP SALE

IBM GOLFBALL PRINTERS from £70 EACH + V.A.T.

INTERFACE FOR IBM GOLFBALL £40 + V.A.T.
*BRAND-NEW LA36 DEC WRITERS — SALE £200 EACH + V.A.T.
CENTRONIC 779 PRINTERS — £325 + V.A.T.
CENTRONIC 781 PRINTER — £350 + V.A.T.
POWER UNITS, 5-VOLT 6-AMP — £20 EACH
FANS, PCBs, KEYBOARDS AND LOTS MORE
8-INCH IBM FLOPPY DISC DRIVES

COME AND LOOK AROUND

**SALCOTT MILL, GOLDHANGER ROAD
HEYBRIDGE, MALDON, ESSEX
PHONE MALDON (0621) 57440**

VIC20 USERS SOFTWARE LIBRARY SIX REASONS WHY YOU SHOULD JOIN

1. Large selection of tapes and cartridges
2. Membership fee only **£10** for 2 years
3. Cassette hire **£1.40** inc. P&P per fortnight
4. Cartridge hire **£2.50** inc. P&P per fortnight
5. All tapes raffled free to members after 15 hires
6. All software hired with manufacturers permission

Send membership fee on full money back approval or large SAE for details, postal only

VIC20 U.S.L., Dept PCWK
11 NEWARK ROAD
BREADSALL ESTATE, DERBY DE2 4DJ

ORDER 2
OR MORE
DEDUCT £1.00
OFF EACH!

SYSTEM-SOFT

FOR THE BEST FROM THE REST

ORDER 2
OR MORE
DEDUCT £1.00
OFF EACH!

THE HOBBIT
(Melbourne House)
£14.95
SPECTRUM 48K

TERROR DAKTIL
(Melbourne House)
£6.95
SPECTRUM 48K

VIC COSMIADS
(Bug-Byte)
£7.00
VIC 20

VOLCANIC DUNGEONS
(Carnell)
£5.00
DRAGON 32
SPECTRUM 48K

PENETRATOR
(Melbourne House)
£6.95
SPECTRUM 48K

THE CASTLE
(Bug-Byte)
£8.00
SPECTRUM

CHESS
(Bug-Byte)
£8.00
BBC 32K

MULTIFILE
(Bug-Byte)
£15.00
BBC A/B

ORDER NOW AND GET DETAILS OF OUR SPECIAL OFFER!
Please send cheque/PO to: **SYSTEM-SOFT**,
FREEPOST, Ackworth, Pontefract, West Yorkshire WF7 7BR

★★ LYNX SOFTWARE ★★

TAPE 1
The maze game, Pac-Man and Breakout

TAPE 2
3D Challenge and Dodgems

TAPE 3
Digger and Battleships

TAPE 4
Lunar Lander: The first and the best for the LYNX with long and short range views of the spacecraft and different gravities, also random landscapes. Subtag: A 100 per cent new arcade game involving a chase containing helicopters, battleships and submarines all at the same time with increasing levels.

LYNX DISASSEMBLER
Disassemble all machine code in ROM or RAM with this useful utility for the LYNX.

Each tape is **£5** including P&P from: **Clive Carter**, 110 Llancayo Street, Bargoed, Mid Glamorgan CF8 6TP.

PEEK & POKE



DIFFICULT CALL

David Parkinson of Woodcote Road, Tattenhall, Wog-verhampton, writes:

Q I have recently acquired a book on ZX80 machine code for the Spectrum. I am having difficulty in understanding the Mnemonic Call.

Is it the machine language equivalent of the Basic instruction *Use*? Also, could you explain how the command could be used in an M/C Invaders type program?

A The mnemonic *Call* is very similar to the Basic command *Gosub*, and it can be used conditionally or unconditionally. It is used along with the mnemonic *RET* which is *Return in BASIC*. In effect what happens when you use *Call* is that you *Push* the return address on to the top of the stack, and then *Jump* to the address you have *Called*.

The instruction does not alter the flags, but it is important that you leave the *RET* address on top of the stack, so you can return. This means that any further numbers put on to the stack by the routine you have *Called* must be *Pushed* off again.

I cannot say with any certainty how you could use *Call* in your particular program, because I have not seen it. However, I would presume that it would be used unconditionally to set up each new screen, and conditionally to check such things as hits and damage to the shields.

LACK OF MEMORY

P D Austin of Weston Park Court, Bath, writes:

Q My interest having been much revived by the arrival of the office mini com-

puter, I recently dragged my old ZX80 out of retirement. But I have become frustrated by the lack of memory, though I am still loathe to give it to the dustman — after all, it did cost £100 in 1980.

However, I have been told by Sinclair that the Ram pack needs the new Rom, is this so? If it is, do you know of anyone who can supply any sort of Ram add on for the ZX80, however small?

A I am very surprised at the response from Sinclair. Unless they have made some sort of change in their later Ram packs, there should be no problem on any ZX80. The only difficulties that might occur are with the old 3K add on, that has not been available for some time. Just to check I used my old (did that really cost £100) ZX80, with a Big Byte Ram pack and found no problems. I suggest that you buy a Ram pack from a shop, explaining the situation, and asking if you can have a refund, in the event that it does not work.

COMPUTER STUDIES

Steve Spencer of Braddon, near Towcester, Northants, writes:

Q I shall be taking my 'O' levels soon and I wish to go to a sixth form college to do computer studies next year. As I am unaware of the sort of jobs available in computing, I would be grateful if you could print a couple of useful addresses that I could write to for more information.

A This is the sort of question that requires an article in its own right. The best place to start is probably a careers officer, and you will find one attached to your sixth form college.

The range of computer related jobs is large and getting larger. Every big company today has a computing department — in some cases it only deals with one particular aspect of the work, in others a computerised system will be found at all levels, for use in all sorts of applications.

The number and range of computers in business is going to increase. People will be wanted to write, maintain, and update the programs.

Letters to all the big com-

panies in your area will probably produce results. Some companies might well take you on as a trainee, once you have done the basic exams at college, other might want you to do further exams.

SPARE 32K

Sean Connelly of Valley Road, Macclesfield, Cheshire, writes:

Q I have put 64K Hitachi Drams into my Spectrum, to make it 48K. I would like to know how to use the other 32K I have spare. I know that it would have to be switched in and out, but any advice on how to do this would be useful.

A The circuitry to do this is quite complex — and I have no detailed information. The only thing I can suggest is that you should contact someone like East London Robotics who offers a 64K memory add-on for the Spectrum. They might be willing to sell you the circuit board or the plans separately.

Sean also asked about a program he sent in. From the copy, it seems that he is missing a data statement. The data is read by a line *For N = 1 to 10*, the problem is that you only have nine data statements. As it is about resistor colour codes, it is probably green that is missing between yellow and blue.

FUZZY ZOOM

Peter King of Manor Gardens, Saxmundham, Suffolk, writes:

Q I own a Sinclair ZX80. Sometimes when I turn it on, the screen goes fuzzy and the computer will not respond to the keyboard. This also happens when I am typing in a long program. Is there anything that I can do about this? Also, do you know if any ZX80 software is being produced?

A From my mailbag there are still a surprising num-

ber of ZX80s in use up and down the country. Your problem could be one of two things — are you using a Ram pack? This used to cause a lot of problems on the ZX80, because as soon as the contacts got dirty between the Ram pack and the port it would cause a crash. The answer to this is to clean the port with some spirit or industrial alcohol.

The second possible cause of your problems is overheating. This is much harder to cure — keeping something cold on the top was the usual solution. But, beware that you do not get any water into the computer!

The other possible modification is to cut slots into the left side of the case above the heat sink. More dedicated/frustrated owners have successfully got round the problem, by literally enlarging the heat sink. This is usually done by cutting out the side of the case above the heat sink and screwing on a piece of copper or brass that then sticks through the gap.

On my ZX80 I used two pieces of thick copper wire that I had beaten flat. Unsuitable, but quite effective.

The problem you sometimes face when you power up at the start could be to do with the restart line. A capacitor between this line and the 0 line will ensure that you get an even pulse, and will slow the restart down enough to cut out any sudden peaks that can occur when powering up. The capacitor needs to be 25v 100 microfarads.

As for ZX80 software, I doubt whether much is still being produced — I certainly have not seen any advertisements for a long while. The only thing that I can suggest is that you scan the small ads in some of the magazines to see if any turn up. If this fails, you could always try placing your own small ad.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem PEEK it to Ian Beardmore and every week he will POKE back as many answers as he can. The address is PEEK & POKE, PCW, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

CASSIFIED

Semi-display — £5 per single cc
Trade lineage — 20p per word
Private lineage — 10p per word

CALL DIANE DAVIS ON 01-839 2476 FOR SEMI-DISPLAY ADVERTISING

GAMES SOFTWARE

SPECTRUM PROGRAMS

SPECTRUM GOLF BY R-R

16K — £3.75 INC
One or two players, nine or 18-hole course, fairways, rough green, bunkers, trees and water hazards. Each course different.

SPECTRUM MICRO CHESS BY ARTIC

16K — £3.95 INC
Accepts all legal moves en passant, castling, and promotes a pawn to queen.

MURDER ON SPEC BY MICROJUCE

16K — £3.50
Ingenious murder game, in which you are the investigator.

Mail order only. Send cheques/PDs to:

VIAJYS, H.K., 11 Margaret Avenue
St Austell, Cornwall
(or SAE for list)
Tel: St Austell 61791

SPECTRUM 16/48K Money Run, multi-level game. £3. Cheques or postal orders to: A. Lee, 10 Foxdale Avenue, Sheffield S12 2FQ.

ALLIGATOR CROSSING, new ZX Spectrum 16/48K game of skill. Send £4.50 to 23rd Century Software, "Aalsmeer", Old Road East, Gravesend, Kent DA12 1NQ.

JUPITER ACE SOFTWARE. Cassette JA1, three-gamer for the unexpanded Ace. C3, Cassette JA2, a 19K graphic adventure, £5 from R. Roberts, 52 Whalesmead Road, Bishopstoke, Eastleigh, Hants SO5 6HL.

SPECTRUM 16K, "Raquel" presents her games for age 16 and over only (State age when ordering). Still only £2.95. Ibrocks, 17 Malvern, Sutton Road, Southend, Essex.

COMMODORE 64

Up to 40 per cent off. Best sellers latest tapes, £3.50 each; new VAT, p.p.s. Gridrunner 1, Gridrunner 2, Attack of the Mutant Camel, Motor Mania, Renaissance, Frogger, King, Scramble, Sprite Man, Crazy Kong, Pacoduck, Cyclone, Monopole. Cheques/PDs to Crestmat 40-45 New Broad Street, London EC2. Tel: 01-740 0447. Mail order only.

ORIC-1 MONEY SPIRAL and Gold Hunter. £2.60. Vic20 Puckman £2. O. J. Wyatt, 77 Redgrave Gardens, Luton, Beds.

ZX81 (16K), Poker, Brag and Dominoes on cassette. Any pair. £2.35, from W. Jefferson, 29 Arundel Walk, Pelton, Chester-le-Street, County Durham.

VIC20 PREMIERE SOFTWARE, hi-res. action with Pac-ball with Clever Ghosts! Brickly with "Trickball", Frooty with hold, nudge graphics creator (hi-res) and more, only £5. The Anchor, South Somercotes, Louth, Lincs, LN11 7BL.

SWAP Flight Simulation Trans. Tower for Hobbit. Tel. 0928 715138.

DRAGON 32, Backgammon, Noughts and Crosses. Full graphics and sound. £5.95 including p.p.s. H. Holt, 2 Woodfall, Astley Park, Chorley, Lancs.

QUALITY ORIC SOFTWARE

THE WORD

Up-market Hangman, with colour and sound

DEATH TRAP

Moving graphics game with facility to design your own graphics

MASTERMYNDE

The fully expanded classic 1-4 players + multi-skill levels + timer

Tapes + instructions: £4.95 each

SAE for full range and price list

Cheque/PD to: Headfield Technology

Lock Street, Savile Town, Dewsbury

West Yorkshire WF12 9BW

LANCASHIRE MICRO

KEMPSTON JOYSTICK CONVERSION TAPE

£4.95. Converts 3D-Tank, Frezzy, Escape, Hungry Horace, Panther, Spawn of Evil and Right

Simulation for use with Kempston joystick

SPECTRUM GOLF £3.95. 16 hole graphic golf

game for the 48K Spectrum. **ZOMBIES FOR**

UNEXPANDED £6.95. Game of strategy —

use the zombies to bury them! AVAILABLE

FROM LANCASHIRE MICRO, 51 QUEEN ST.

MORECAMBE, LANCs. Tel: (0524) 411435.

DEALER ENQUIRES WELCOME

ACE SOFTWARE. Seven games for the unexpanded Jupiter Ace, only £4. Federation Software, 56 Rawley Crescent, New Dutton, Northampton.

DRAGON 32

ACE HIGH

One Spitter's Battle of Britain. Destroy nine enemy planes and earn your Wings. 25 hits and you are the Ace! Up to ten minutes' violent action

High res graphics, cockpit view, rear mirror, 3D action, realistic sounds, reward systems and detailed scorecard. A quality 32K game. Not available in shops or libraries or club systems

Fast service. £7.95 includes p.p.s.

TUDOR WILLIAMS

15 SUMMERHILL ROAD

BILSTON WV14 4RD

CHRISTINE COMPUTING

T99 4A SOFTWARE

NORTH SEA, CODE BREAK

ASTRO-FIGHTER

£3.50 each, £6.60 for two

£9 for all three

SAE for Hardware/Software Catalogue to:

Dept PCWK, 6 Florence Circle, Watford, Herts.

ZX81 16K. Avoid colliding as you race around the maze, while the other car tries to intercept. Fast machine-code action, plus Hangman. £3.50. J. Riley, 322 Bramhall Lane, South Stockport, Cheshire.

ESCAPE, new graphics game for 16K Atari. Five levels, cassette £5. Coulter, 56 Grosvenor Road, Epsom Downs, Surrey.

* LYNX MUSIC-MASTER *

Now LYNX music is easy! Full two-octave claviers on screen, compose, copy, replay, change tempo, etc. Cassette and full instructions £4.95.

ALBASOFT, 180 Terragles Avenue

Glasgow G41 4RR

VIC-STRIP, adults only game for any expanded Vic20, tape £5, disk £10. Includes p.p.s. and Life Expectancy game. Pen Design, 21 Langbar Close, Bitterne, Southampton SO2 7JH.

BBC 32K GRAND PRIZ, Crackcode, Hangman, Iron, Connect 4. All graphics games, £3.50 each including p.p.s. Darren Graves, 34 Stoke Lane, Geding.

MISSILE. Defend your cities from the deadly onslaught. Graphics game for the BBC microcomputer (32K), only £5 inclusive. To: Paul Stevens, 11 Woodhurst Close, Cuxton, Rochester, Kent ME2 1LU.

DETECTIVE. FOR 16K/48K SPECTRUM.

Full colour, sound and high resolution graphics.

Pursue notorious Fingers McKee through Glasgow's Shady Streets and attempt an arrest before he escapes the city or your boss pulls you off the case. Your job is made more difficult as he is a master of disguise, but he

must be brought to justice!

Special introductory price of £4.95 + 50p

p.p.s. to: Mr. G. Chapman, Brooksmarket Ltd,

Crendal Road, Exhall, Coventry.

VIC 20 SOFTWARE

All the Imagine Software Cassettes including: Arcadia, Whacky Waiters, Catcha Snatcha, Frantic. All for either the expanded or unexpanded computer.

New for the ZX Spectrum: Jumping Jack.

All at only £5 each!!

(includes of postage and packing)

Send cheques/PDs to:

RULE COMPUTERS

30 Tylers Acre Road,

Corstorphine, Edinburgh

EH12 7HZ

(Tel: 031-334 7261)

FOR THE VIC20, from Arcsoft comes Zap-Man. Hi-res graphics, colour, sound, fast machine code action. All this for the unexpanded Vic for just £4.00 inclusive. Send cheque or PO for fast delivery, to S. Fansome (Arcsoft), 73 Blackthorns, Rushden, Northants NN10 9PF.

ORIC 1 48K, Frenzic: hi-res graphics, on-screen display of score, timer, lives lost, 4 skill levels, hi-score feature, gears give total control over speed, full instructions supplied. Cheques/PO for £3.25 (including p.p.s.) to N. Edwards, 1 Chalfont Avenue, Christchurch, Dorset.

CLASSIFIED ADVERTISING RATES:

Line by line: For private individuals, 10p per word, minimum 10 words.

For companies, traders, and all commercial bodies, 20p per word, minimum 20 words.

Semi-display: £5 per single column centimetre, minimum length 2 cm. (Please supply A/W as PMT. Or "speak rough setting instructions.")

Conditions: All copy for Classified section must be pre-paid. Cheques and postal orders should arrive at least two weeks before the publication date.

If you wish to discuss your ad, please ring Diane Davis 01-839 2476.

Here's my classified ad.

(Please write your copy in capital letters on the lines below.)

Please continue on a separate sheet of paper

I make this words, at per word so I owe you £

Name

Address

Telephone

Please cut out and send this form to: Classified Department, Popular Computing Weekly,

Hobhouse Court, 19 Whitcomb Street, London WC2

LYNX 48K SOFTWARE

LYNX — 10 Maze Game
 (also in fast version of popular board game)
 Chancelor — the UK economy for 10 years

Space Trek — zap the Klingons.
 £4.75 each inc. inc. p&p. Cheques to: O. to:
 QAZAR COMPUTING DEPT. PO. 10
 17 TIGER CLOSE, PORTSLADE, SUSSEX

SPECTRUM SOFTWARE. 30 programs in one tape including Casino, Piano, Geography, Midway, Submarine — for only 56 p/p included. Dambly, 10 Rue St Gertrude, 1040 Brussels, Belgium.

UTILITIES

SPECTRUM BACK-UP COPIER

First of its kind to back-up programs by making tape-to-tape copies. Now KEYSOFT present

THE KEY
 100% machine code! Copies any type of program. Easy to use.
 Order THE KEY by ZX Spectrum only £5.95

KEYSOFT, Dept PKC
 6 Bruce Grove, London N17 6RA
 NB: KEYSOFT advise users not to infringe the Copyright Act

Dealer Enquiries Welcome

TELETEXT ON YOUR SPECTRUM. ZX test lets you create your own personal teletext system. Similar to Ceelax and Oracle. Capacity 900 pages. Full colour, graphics, flashing, inverse video, 24-hour clock with alarm, even the engineering test pages — it's all here! Cassette £4.95 complete with sample system. Full instructions and 12-month guarantee. Send cheque/PO (or SAE for details) to: Iain Stewart, 12 Tony Drive, Alva, Scotland FK12 5NQ.

SPECTRUM "SMIFFER", reads tapes and prints out program name, length in bytes and start address. Machine Code and Basic! Also gives auto run line number, £2.50 from AWA, 50 Dundonald Road, Disbury, Manchester.

SPECTRUM 64 PRINT, Amazing Software that gives 64 characters per line instead of 32, prints anything from your line number, cassette, 48K or 16K, £3.50. K. Ahmed, 28 Maggie Hall Lane, Bromley, Kent.

5D SOFTWARE

Z80A machine code programming for ZX81 16K.
 Two Cassettes plus Instruction Booklet, many examples and useable sub-routines for your own programs, £17.50.

Enquiries and cheques to:
 Hemmings Cottage, North Lopham,
 Diss, Norfolk, Tel: 037 988543

BBC (AIB) KOPYCAT. Simple, effective routine to back-up machine programs. Send £1 + SAE to: M. A. Paris, 38 Woodburn Manor Park, Woodburn Green, Bucks.

TAPE COPIER — copies virtually all Spectrum programs (16 48K). Verifies multiple copies. Two versions on cassette (one uses no program area). Money back guarantee. L. Evans, 16 Stonepit Drive, Cottingham, Market Harborough, Leics.

SPECTRUM SERIES 2 reset and colour monitor modifications, instructions, £1.50. J. M. Aimey, 42 Falkland Court, Bramintree, Essex CM7 6LL.

DATAFILE 48K SPECTRUM. 20 entries of three lines, storage retrieval, alpha numeric sort, plus search and printer, facility for listings. Only £3.50 inclusive. Ashleysoft, 36 Glenlue Road, London SE3 7SG.

BBC B. TWO UTILITIES plus game Mortgage, gives complete statement over any period. Graphic, enables 8 x 8 or 16 x 16 character definition. Pelmanizer, game for up to four players. Cassette £5, listings £3. W. Hayles, 44 Castleview Road, Slough, Berks.

NEWBRAIN. High-resolution character generator creates up to 256 symbols for easy use in your Basic or m/c programs. £5.95. Also full Z80 Disassembler in Hex/Decimal allowing hard copy screen dump, £4.50. From C. Dixon, 57 Marine Parade, Brighton. **ZX81 COPIER.** Lets you stop study copy any ZX81 program, on cassette, £2.50. Bookers, 28 Chadderton Drive, Unsworth, Bury, Lancs.

SPECTRUM KOPYCAT £4.95

100% machine code. Enables almost any ZX Spectrum program or data file to be backed-up on to a fresh tape.
 Programs over 41 5A TK for 16K models) can now be copied with ease.
 Plus: FREE Tape-header Reader program. Both programs on one cassette. Only £4.95. IMMEDIATE DESPATCH. Send cheque/PO to:
MEOSOF
 81 Ardene Road, Doncaster DN2 5ER
 (IT CAN EVEN COPY ITSELF)

AUTOMATIC line numbering program for any Vic20. This 100 per cent machine code program is quick and easy to use. Cassette with instructions, £2. From S. Pendry, 65 Stonewood, Sean, Dartford, Kent. **SPECTRUM KOPYCAT.** Make security copies of your favourite programs. Copies any Spectrum tape file. 16 48K. Easy to use. £4.95 from AWA, 50 Dundonald Road, Disbury, Manchester.

007 SPY COPIER

Simply load your Spectrum then press 'C' for instant copy. With program to enable shops to study any file in Basic. Program £3.95. (Previous 007 Spy Updated send cassette plus £1.50 to have order added).

BOOKER, 29 CHADDERTON DRIVE
 UNSWORTH, BURY, LANCs

SPECTRUM REFLEX 48K, makes back-up copies of virtually any program! 100% machine code, £3.95. JN software, 11 Latton Close, Chilton, Didcot, Oxon, OX11 0SU.

HOME

MANAGEMENT

STOCK CONTROL FOR

ORAGON

Usual facilities, tape files, all output to screen, program and manual by return post, cheque for £19.95 to: Zafco Micro Business Software, 44 Falcon Crescent, Fritchwell, Beds.

COURSES

Microcomputer courses at Durham University

for young people and/or parents. Full board accommodation, first-class instruction. Courses from August 6 to 27, at £80—£100 per week including half day excursions. SAE for details. Assistant Bursar, College of St Hill and St Bede, Durham DH1 1SZ. 0385 63741.

CALEDONIAN computer consultants provide programming consultancy and training courses in Basic, held regularly for beginners upwards. 292 Caledonian Road, London N1 1BA. Tel: 01-607 0157.

WESTON-SUPER-MARE COMPUTER COURSES

Non-residential, for those on holiday. Qualified staff. Small groups. Limited vacancies July to September. Children accepted. SAE for: CC, 18 Stafford Place, Weston-super-Mare, Avon BS23 2JZ.

FAIRS

MICRO-COMPUTER FAIR

Wister Gardens, Malvern, Worcestershire

Saturday, 2nd July, 1983

10.00 am—5.15 pm

★ ★ ★

Everything to cater for the Computer Enthusiast
NUMEROUS STANDS

SOFTWARE **SELF SERVICE**
HARDWARE **RESTAURANT AND INFORMATION** **LICENSED BAR**
COMPUTER CLUB STAND
★ BRING AND BUY STAND ★

See your Unwanted Programs!
 Books-Computers

Details from Personal Computer Fairs

Marin Bennett, Worcester 22659

SOFTWARE

VIC20 MACHINE CODE program, want to store machine as basic data statements? Let Davesolver do it. This machine routine converts code and actually writes lines of basic, merging them with your programs in seconds. Any expanded VIC. Full instructions. Cassette £3.50. R. Bartless, 81 Dogfield Street, Cardiff, S. Wales.

DRAGON INDEPENDENT OWNERS ASSOCIATION

MATHS DEBUT. Programme Maths Race. Children of all capabilities can play on equal terms. Kids can play day.

MATHS ADVENTURE. Aimed at 9-11 years, use their maths and tables to get into the secret cave and defeat the Maths Monster. £4.95 to DPGA School House, Wister Gardens, Coney Island

COMPUTER RATING METHODS

Put your computer to good use for pleasure or profit during the 1983 FAI or WAI racing season with the most up-to-date and professional computer rating method ever put on sale to the racing public, giving you top-rated selections at good prices. Lasts a life-time. Cassettes for ZX81 and Dragon 32 only. Printed programs for ZX81, Dragon 32 and Spectrum only. £10 for either cassette or printed program.

Send cheque/PO to: CRM 14 Langdale Place, Newton Aycliffe, Co Durham DL5 7DX

ZX81 OWNERS

SPECIAL LAUNCH OFFER

Flipdisks: Two On One - Free Gift: Read On

Each cassette cost £3.25 inc P&P

FL1 (A) Side — House Of Cards

Flipdisks — Spelling Time Bank

FL2 (A) Side — Semaphore Tutor

Flipdisks — Morse Code Tutor (with sound)

FL3 (A) Side — Horse Race Analysis

Flipdisks — Football Analysis

FL4 (A) Side — Kiddies Adventure

Flipdisks — Maths Time Bomb

Buy all Four Flipdisks and choose a Free Gift

Gift: (1) A 16K Ram Pack or Gift (2) A Push Button Keyboard

Don't delay — send today cheque/PO to:

WV SOFT COMPUTER SERVICES

C/o M. C. Agency, 2nd Floor, Colwyn

Chamber

24 Mosley Street, Manchester M2 3AG

ZX81 MICROFILE 16K. An information storage system. Variable format with simple entry and powerful accessing abilities. Each file can be up to 11,000 characters long and all entries are automatically stored in alphabetical order. Invaluable aid for teachers, hobbyists, etc. Only £4.50 from Kaycee Supplies, PO Box 46, Grimby, Humberside.



KUDUSOFT BBC MICRO SOFTWARE

STARBATTLE. Destroy the Alien Starbattlers before they get through to you. Alias the tremendous reentries. Full colour and sound effects. For MODEL B. £5.50 inc p&p

STARLANDER. Makes full use of MODEL A. Test your skills in landing your Starlander under increasingly difficult conditions. Full colour and sound. £3.50 inc p&p

130 MAIN STREET, TWEECHMOUTH
 BERNICK-UPON-TWEED TD15 2AW

Ambitious Programmers with Big Ideas ... become a Software Mogul!

How? By becoming a **MOGUL** programmer.

MOGUL SOFTWARE is part of a long established home entertainment company with interests in video software and records. Our proven national and international marketing expertise has led to many years of success. Now we are turning our attention to games software.

We're looking for big thinking game programmers with machine code experience who can produce exciting and innovative ideas for the Spectrum, VIC 20, Atari, Dragon, BBC, Oric, TI 99/4A and Commodore 64.

For big ideas, we'll pay big royalties. Or we'll purchase your programmes outright. If you prefer, we'll offer a mixture of the two. Then, as a software "mogul", just watch your bank balance grow as we market your programmes in the UK, Europe and the USA... all with extensive advertising support.

THINK BIG... THINK MOGUL!

Write to: **Mogul Software, PO Box 487**

35-37 Wardour Street, London W1A 4BT Tel 01-437 3157



WANTED

For immediate and massive distribution in the USA:—
 Quality Arcade games for VIC 20 and COMMODORE 64
 Phone: BASINGSTOKE (0256) 25107 or write to:
 DREAM SOFTWARE, P.O. BOX 64, BASINGSTOKE,
 HANTS. RG21 2LB

DREAM software

EDUCATIONAL SOFTWARE

SPECTRUM JUNIOR MATHS, 16 48k, animated colour graphics, sound, £4.50 for four excellent arithmetic programs. R. M. Harris, 27 Glendale Avenue, Eastbourne, Sussex.

BUSINESS SOFTWARE AND HARDWARE

NEUBRAIN SOFTWARE. Business and serious application. Fully descriptive price list available on request. Cornix-Micro, 16 Kneetsworth Street, Rye, Herts SG4 5AA.

HARDWARE

SWAP Videomaster Star Chess TV game for proper keyboard for ZX81 or extended basic cartridge for TI99/4A. Tel: Fleetwood 4045.

SARGON CHESS COMPUTER with Morphy Master Chess cartridge and magnetic pieces, £75 including recorded delivery. Heppburn, 4 Cardinal Avenue, Kingston, Surrey KT2 5SB.

SWAP VIC20 3K for your games cartridge. Also printer paper and games for sale. Phone 907 7670 (5 pm to 9 pm) ask for Mary.

EXCHANGE Azden 1000 (5 cm to 9 cm) for sale. £150.00. Also 1000 transceiver FM/CB, value new £189, for colour computer. Bath 20274.

SWAP cine outfit Eumig projector, quartz camera, tripod, Elmo editor, bead screen, for Spectrum, Dragon, BBC etc. Phone Bath 20274.

ACCESSORIES

SMART, WASHABLE PVC COVERS with cotton binding available for any computer, printer etc. BBC, TI, Epson, £3.95. Dragon, Atari, Vic20, £2.95. Sharp M780AK, £4.95. For others please phone or write to Sherborne Designs, Victory House, 84 The Rank, North Bradley, Trowbridge, Wilt. Tel: 02214 4425. Also made to measure service. Dasher enquiries welcome. Access and Barclaycard.

CASSETTE LABELS PRINTED, self-adhesive, any amount. SAE samples. Six-Jays, Swanpool, Falmouth, Cornwall.

CLUBS

ORIC-1 OWNERS. Tangerine created Oric-1 now TUG creates the rest. An independent users group with a solid reputation for progressive system support. Monthly newsletters, meetings, software, hardware, reviews, advice and lots more. We have a proven record of performance on our system. Join TUG. You'll like us, we do! Send £1.00 + SAE (A4) for sample newsletter and details. Tangerine Users Group, 1 Marlborough Drive, Worle, Avon BS22 0DD.

SOFTWARE EXCHANGE. Swap your used software via our club. Free membership. £1 per swap. Most computers included. SAE for details. UKSPS, 15 Turnwell Greave, Sheffield, S5 9GB.

MAGAZINES

ORIC USER PROGRAMS NEWS VIEWS
£10 for a year's sub
To: 20 Wynford House,
Wynford Road, London N1

SERVICES

ORIC/TANGERINE PRINTOUTS. Send your programs on cassettes and I will return a high quality printout for £1.60 by return post. 50p for revised programs previously listed. Paul Weller, Arley House, Hanley Terrace, Malvern WR14 4PF. Confidentiality assured.

SOLVE BAD ZX PRINTINGS. Send 75p to Paul Silverman, 81 Adelaide Road, NW3 3 NL.

BUSINESS SOFTWARE

DRAGON-32 BUSINESS SOFTWARE. Business Utility Pack 1 £8.95, Letter Writer £9.95, Price File £9.95, Mailing List £19.95, Stock File £24.95, Telewriter Wordprocessor £49.95. Coming soon — Data Base, Invoicing... Send SAE for complete list or £1.00 for our software preview cassette. Cheque PO to B. MISTRY, 75 St. Margaret's Road, Bradford BD7 2BY.

DEALERS

ZX81 High Res Graphics Unit
£32 (excl. VAT)

Tel: William Haynes 01-969 0819
Tools for Living

Notting Dale Technology Centre
191 Preston Road, London W10 6TH

Cheque PO (add 15% VAT)
plus 75p p & p

COMMODORE 64

£164.00 (excl. VAT)
64 Programmers Ref Manual £9.90 + £1.50 p & p

Tel: Chris Gurney, Dave Walsh or Floyd Patterson

Tel: 01-969 4658/7527 or send SAE

Image Science Micro Computers Ltd
189 Preston Road, London W10 6TH

or cheque P/P (add 15% VAT) and £8 for p/p (Securion) delivery
Prestel Frame 4820000 (a) for latest software and hardware information and prices. Full after-sales maintenance on all Commodore Equipment bought from us.

COMMODORE 64 + Vic20 SOFTWARE AND HARDWARE FROM NOLANSO ELECTRONICS

Large selection of cassettes and cartridges available, including Fort, Gridrunner, Educational programs, etc.

Mail orders accepted

Phone Karen

Biggleswade (0767) 316702 (24 hrs)

WANTED

WANTED, 8K Ram for Vic20. Tel: 01-805 2456 after 6 pm.

LOOKING for a market for your programs? List of 50 suppliers, UK and US, who want software for ZX81, Spectrum and others. 50p including postage. ZX80/1 Register, lists suppliers, software, hardware, publications. £3.95. Youngs Computer Publications, 2 Woodland Way, Gosfield, Halstead, Essex.

WE ARE currently looking for original preferably debugged games and utility programs. Anything from 16K to 24K is acceptable. If you have any programs that fit these criteria write to: Bamby Software, Levering, Isle of Harris.

WANTED. Used ZX81 64k plus Fuller or DKTronics keyboard or 48K Spectrum plus Fuller etc. Tel: 01-527 8986 (evenings).

WE BUY all your working ZX80s. Send details of your machine and software to H. L. Graft, 147 Wynchgate, Winchmore Hill, London N21 1QT, for a good quotation.

ARIADNE SOFTWARE LIMITED

Experienced, slightly older, small microcomputer company seeks bright-eyed young programmer — object: exploitation. 6502 experience and 16 fingers an advantage.

275 Kensal Rd, London, W10

FOR SALE

SHARP MZ 80K. Under guarantee. Excellent condition. Offers invited. Tel: 0458 43079.

ZX81, 16K, leads, manuals, original box. Five games including Pimania Chess. £50. Tel: Bagshot 76564.

ZX81 with professional keyboard + 32K Ram + ZX99 tape control system + plus all leads, manuals and software. £160 ono. R. Heywood, 73 Heol Pendryns, Ferndale, Mid Glamorgan, LF43 3PE.

BOMBER, for the 16K or 48K Spectrum. Can you bomb the city and land your plane? Features sound, colour and hi-res, graphics. £2.50. Cheques or PO to P. G. W. Jones, 4 The Ridings, Worthingham, Beccles, NR34 1RG.

VIC20 + C2N cassette deck + Commodore joystick + programmers reference guide + book of programs and cassettes. Sell for £150. Tel: 891902.

MATTEL INTELLIVISION CONSOLE plus six cartridges, boxed as new, £120 ono. Tel: 01-346 7080.

VIC20, C2N tape, printer, machine monitor, super expander, programs all 16K expanding. £180 of software. £30 of books, joystick. Worth £700 +, will sell for £500 ono. Tel: 0438 54178 after 4 pm.

VIC20 + C2N cassette deck + programmers reference guide + books + a few cassettes. Will sell for £120. Tel: Cambridge 891902.

SIOUX TUSCAN SYSTEM. Main board complete in case with power supply, keyboard, manual. £300. 64K DRAM £200. Disc controller with SBIOS £160. Tandon SS-D disc drive £90. V84 memory mapped VDU £110. Termination board £15. CP/M SOFTWARE. CP-M2.2 with manuals \$60. TCI. Plus £70. TCI disc BASIC £30. Wordmaster 2 with SAS. BD5C compiler £50. Macro-80 assembler £50. All fully working. £1,000 the lot. Wood, 47 Crick Road, Hillmorton, Rugby. Tel: 0788 69447 evenings.

EXCHANGE. Lake X850 man, 40 channel, power pack, aerial, for ZX81 and extras, want 16K expansion pack. Tel: 092-575 4996.

SPECTRUM 16K plus Golf, Escape, Cruising, still in box, with all books, leads, etc. £90, possible swap. Tel: Adrian, 01-892 2721 evenings.

UK101 8K cased with Cegmon and Extended Basic. 2MHz. £85. Tel: Ash (0304) 812279.

LYNX 48K, brand new, still in original packing. £200. Tel: Oington 20281.

ATARI 400, recorder, basic, assembler, joysticks, games, books. £200. Letchworth 70331.

OVER 60 COMPUTER MAGS, £12, 2 disc cases plus 5 floppy discs. £5, £14, various books. P.O.A. Tel: 291-2327.

"POPULAR COMPUTING WEEKLY" magazines. Complete set for sale in mint condition or will swap for Vic20 software, offers only. Tel: 0789 841310.

SPECTRUM VOICE CHES, 48K, £8. Freenzy 16K, £3.50. Send PO/cheques and SAE to: P. Kiron, 59 Bankes Road, Small Heath, Birmingham, B10 9PP.

DRAGON 32 plus joysticks plus 15 cassettes plus books, six months old. £150 ono. Tel: Birmingham (021) 459 7933 after 6 pm.

ATARI VCS and 11 cartridges: Starmaster, Asteroids, Defender, etc. Worth £350, will accept £150. Mint condition. Tel: 061 339 6121.

VIC20 + C2N + 16K reference guide. Mastering the Vic20, joystick, £40 software, only 10 months old. £150. Wimbledon 879 0471.

TI-99/4A. Excellent condition including leads, war game. £100. Tel: Southampton 766153.

DRAGON SOFTWARE for sale, £4.50 per tape: Space War, Grand Prix, Star Trek, Ultimate Adventure, Games Conundrum, Katapult Attack. Tel: 0505 25001 after 6 (0789) 740558.

ACORN ATOM, 8K Rom, 9K Ram plus software, £68. Phone Canterbury 51241 (evenings).

TI99/4A with extended Basic, Speech Synth, Attack cartridge, joysticks. £75 of software, and all leads. £280. Tel: Stratford-on-Avon 0789 740558.

TI99/4A. Five months old plus Adventure and Home Management Modules, cassette, leads, few other games. Worth £220 +, Offer £110. Tel: 01-274 6072.

FOR SALE: ZX81 + software, hardly used, only £25 ono. Also Vic20 16K Ram cartridge + Vic Highway code + IQ software, £45 ono. Sold separately if required. Tel: 01-980 1934.

SPECTRUM 48K Word Processor, £3.25. Available from Stephen Bayle, 14 Norwood Road, Strefford, Manchester M32 9TZ.

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer.
Ring 01-930 3266 and give us the details.

Spectrums for sale

SURDAN ZX SPECTRUM 48K, software and console, £160. Tel: Torquay 22058.

SINCLAIR SPECTRUM 48K. As new, £100. Tel: 0344 57908.

16K SPECTRUM. Excellent condition, leads, manuals, horizons and tape. Bargain at £85. Tel: 0795 663618 after 6 pm. Wanted BBC B.

48K SPECTRUM + printer, with six rolls of paper + £140 software. Sell for only £195 (require fast sale). Tel: (061) 9732229.

DKTRONICS Spectrum keyboard, £40. Tel: 01-399 5585.

ZX81s for sale

ZX81 16K, leads and manual, 49 magazines, two cassettes, £50. Bill Wells, 31 Pendre, Powys, Wales.

ZX81, 16K Ram + two tapes, £50, no offers. Tel: 0279 28509 and ask for John.

ZX81, 16K, £32 software, £60. Tel: 01-992 5870.

ZX81, 32K Ram, 16K Memotech and 16K Sinclair, four months old Plus book and software, £80. Tel: Cheshire 05065 51553.

ZX81 + 16K Panda expandable Ram, still under guarantee, also tapes, books, all leads and instruction manual, £70.00. Tel: Alcoa (0259) 723961.

Tandys for sale

TANDY CPP115, four colour, printer/plotty, with spare paper and pens, £120.00. Tel: Coventry 618579.

TANDY TRS80, level II 16K + leads and magazines, £220. Popular arcade games and others, £250. Tel: Bedford 740513.

TANDY MODEL 1, 48K memory, disc drive, VDU lower case modification, programmable sound generator, £550. Tel: Bristol 0272 615426.

TANDY TRS 80, level 2, 16K, including VDU CTR80 cassette deck, disc cover, large list of software, cassettes and books. TRS 80 Teach Yourself Basic. £200.00. Tel: 521-0672.

Acorns for sale

BBC MODEL B, 1.2 operating system, still boxed, never been used, cassette leads + 3 tapes, Acorn software, Early Learning, Snapper + Castle of Riddles, + JVG 12-inch hi portable TV, £300. All brand new, £380. Tel: 01-641 1304.

BBC MODEL B, 32K, + software, £300. Will sell software separately. Tel: 090 567444 (any time).

BBC MODEL B for sale, unwanted gift, hardly used. All offers considered. Call 01561 220307 (any time).

ACORN ATX, 12K + 12K fully expanded Atan, excellent condition, power supply unit, books and software included, £135.00. Tel: Billericay 51428.

Dragons for sale

DRAGON JOYSTICKS, used once, £15.00. Tel: 031 8848 (after 5 pm).

SWAP DRAGON RACER BALL for Caterpillar Attack or Talking Android Attack. Tel: 0462 64033 after 4.15 pm.

DRAGON 32, 7 months old + books, £150. Tel: 0738 2311.

Ataris for sale

ATARI 400 with 48K of RAM in home keyboard — H4 output socket with 410 program recorder, basic, Star Raiders, Music Composer Assembler/Editor, + joystick, WFO £450, sell for only £300. Tel: Swindon 750893 after 8 pm.

ATARI 800, £60 software, some books, £375. Tel: 736 3889, Mr Robinson.

ATARI VCS, 12 cartridges including Missile Command Defender, Asteroids, Berserk and Telescooper, very good condition, £199.00. Tel: 03552 23069.

ATARI VCS with all accessories, in good working order, £40, also cartridges including many favourites, £8 upwards, the lot £170.00. Tel: Slough 20735 (after 5 pm).

ATARI INTELLIVISION TV GAME

with 11 cartridges, will sell for £150.00. Also ZX81 games for sale, 3-D Defender, Catacombs, 3-D Monster Maze, £3 each or 3 for £7. Tel: 0925 51753.

ATARI VCS, 5 tapes, Pacman, Ast, Si, Street Racer, Combat, Boned, new, £130.00. Tel: Camberley 21718.

ATARI INTELLIVISION cartridges including Packman, Defender, Indi-500, Asteroids and Space Invaders + Driving Controllers for Indi-500, good condition, one year old, £160. Tel: Wadhurst 3332.

ATARI VCS with seven cartridges, £35. Tel: Lee Valley 712822.

ATARI VCS with seven cartridges, £35. Tel: Lee Valley 712822.

ATARI VCS with seven cartridges, £35. Tel: Lee Valley 712822.

ATARI VCS with seven cartridges, £35. Tel: Lee Valley 712822.

Commodores for sale

VIC20 GAMES, Strambee, Space Phrecks, Asteroids, Vic Panic Cosmeuds, Frogger, Galaxians, Space Invaders and Berserk. The whole lot is worth £70, will sell to the first person who sends £20 to: T. Wilson, 21 Chention Field, Fulwood, Preston, Lancashire PR2 3LOH.

VIC20 + cassette deck + synthesizer tape + book, £120. Tel: 01-340 9611.

VIC20 software to swap or sell including Lazerzone, Tracks, Vic Rescue, Tomb of Drowin, Fantasia and many others. Tel: 0442-67150.

VIC20 to swap or sell any cartridges/games, including Rabbitsoft programs, Imagine and Romik. Tel: for details, Farnham 270081.

VIC20 3.5K tape recorder, any offers. Tel: Baskin 568509.

COMMODORE 64, 15 top-class arcade and educational games. Buy, part exchange or swap your Commodore 64 game. Price range from £2.95 to £7.95. We have the latest releases, priced at £5.95 each. Tel: 01-450 4858.

VIC20 + with cassette, joystick and chess cartridge + other software, five months old. Fully boxed. £170.00. Tel: 537 5102.

VIC20, hundreds of programs for sale and swap including all Imagine programs, most Rabbit and Romik software, + 24 different cartridges including Pacman, Galaxians, Space Invaders, Cave and many adventure programs. Tel: Alex on Farnham 270081.

VIC20 with 8K expansion Motherboard, complete with C2N cassette player, joystick and Superexpander unit. Lots of games, manuals and book worth £300, will sell for £225. Tel: 01-657 1305 after 5 pm.

VIC20 C2N cassette UNIT, still under guarantee + 3K, 16K and 32K Ram packs, Superexpander and joysticks, with over £400 of books and software, including Basic 1 and 2 and four adventure cartridges. Only £500. Tel: 01-771 1300 after 6 pm.

VIC20 + cassette deck, still under guarantee, 3K, 8K Ram packs, five games cartridges and cassette software, £170. Tel: Poole 671650.

5K VIC20 cassette unit, software, two books, a manual and magazines, £125.00. Tel: 01-455 6641 after 4.30 pm.

INTRODUCTION TO BASIC, never used, £10. Mission Impossible (celophane wrapped), £20.00. Swap most Commodore cartridges + Spiders of Mars, for any other cartridges. I also swap cassette software. Tel: Deside 815277.

VIC 16K cartridge + cassettes, Defender, Crazy Kong, £30. Tel: 021 440 2124.

16K MONEY MANAGER requires 8 or 16K extra memory, unwanted present. Never used swap for two cassettes (games). Tel: Norwich 0603 409534.

VIC20 TAPE RECORDER, £32, brand new. Tel: 01-604 6780.

VIC20 CARTRIDGES for sale. Tel: 06956 38564.

VIC20 + C2N + 16K + 3K expansion units, well over £1,000. Software (mainly games), joystick, mags, manual, two-game cartridges, value approx £1,400, will accept £385.00! Tel: 06956 38564.

COMMODORE 64 with cassette unit and joystick, still under guarantee, £320.00. Tel: Preston 0772 615397.

VIC20 + cassette deck, 3K hi-res graphics cartridge + all leads and manual, £145. Tel: Oxford (0865) 247 638.

VIC20 + cassette unit + joystick, various manuals, tapes and books, two months old, £100.00 or swap for Sinclair Spectrum. Tel: 01-289 9451.

CBM4032 Commodore Computer Command — 0 chip, 9-inch screen, good condition, £375. Tel: Washington 091 470754.

For sale

ZX 9 volt power pack, £7.50. Tel: Alan 061-673 9728.

VIDEO GENIE E9 3003 and leads, two years old, £135.00. Tel: Colchester 860710.

VIC20, Many cassettes to swap for unexpanded and 16K. Also Pirate Cove for Voodoo Castle plus count. Tel: Richard, New Milton 0425 611094.

SWAP Adventureland for any other Vic20 adventure not Voodoo Castle. Tel: Swanley 66180 (David).

SECONDHAND APPLE GAMES, half price: Scrabble, Epoch, Microchess — sell or exchange for other Apple programs. Tel: Wigan 47574.

SWAP Mission Impossible for other adventure on Vic. Also swap cartridges: Road Race, Super Landlord, Avenger, Alien and sell £12 each. Tel: 0733 214943 (after 6 pm).

SPECTRUM GAMES FOR SALE half original price. Tapes include Hobbit, Penetrator, Hungry Horace, Arcadia and many more. Tel: 0268 27054 (anytime).

SWAP "Know Your Own Personality" for "Know Your Own IQ". Tel: Sandy-acre 397892. For VIC20.

PRINTER WANTED, minimum 10 inch with Zentronic parallel interface, in exchange for three items: Adler Professional, carbon ribbon, electric typewriter, Zenith SLR camera. Tel: 58 programmable calculator. Tel: Milton Keynes 0908 677407 Evenings. (Bell).

PIRATE COVE adventure cartridge for Vic20. Swap for Voodoo Castle. Tel: Simon 673 5819.

ONE SET Apple disc drives with controller card plus manual and DOS disc, £450.00. Tel: 051-922 3639.

VIDEO GENIE ED3003 with manuals plus box and £90 software, excellent condition, £150. Tel: 0385 67867.

ACETRONIC MPU 2000 and four good

cartridges, cost £140, sell for £50.00. Tel: Bourne End, Buckinghamshire 23797.

GAMES SOFTWARE for Vic20 and ZX Spectrum to swap or sell. Tel: 041-557 1533 after 5 pm.

INTELLIVISION, six months old plus ten cartridges, £130.00. Tel: Weylyn 4417.

INTELLIVISION plus nine cartridges, boxed and guaranteed, £160.00 or swap for your Atari 400. Tel: 01-310 8109 after 5 pm.

R.D. DIGITAL TRACER, £35. Brand new. Tel: Wigan 58719.

SHARP SHARP M200A with software for BBC Model B. Tel: Belfast 211668.

VIC20 SOFTWARE: Robert Camer, Menu Planner, £5. Sub-Space Striker plus 20K, £3.50. Tel: 083 525737.

VIDEO GENIE Fred sound synthesiser, hi-res graphics board, 16K. Tel: Weylyn 4915.

INTELLIVISION GAMES console, eight cartridges, £120. Tel: 591 0915.

ADVENTURELAND CARTRIDGE for Vic20. Swap for The Count. Tel: 0572 3384.

ALIEN CARTRIDGE for Vic 20. Swap for Tank Attack or sell for £10. Tel: 0572 3384.

BRAND NEW EPSON MX20 in new raffie, including micro cassette and AC adaptor, £470.00. Tel: Oshott 3765.

VIC20 SOFTWARE to swap or sell. Tel: 0442 58200.

SHARP PC 3201, complete 64K, dual disc drive, 12 inch screen monitor and printer, CPM compatible. Will accept first offer £1,250. Tel: 01-952 4836.

R.D. LABS, digital tracer, £45. Tel: 0602 264851.

Wanted

WANTED, Vic20 cassette unit, must be in good condition. Tel: 01-890 3039.

BBC SOFTWARE to swap. Tel: Frome 0373 61552.

WANTED Membrane keyboard for ZX81, will pay £5. A. C. Durrant, Flat C11-4, James Baile Falls, North Hill Road, Leeds 8.

WANTED modules for minimum and extended Basic, T99-44. Any fair price. Tel: Isle of Man, St Johns 309.

WANTED, BBC Model B. Tel: Chester 315912 (daytime).

WANTED, Printer ZX Spectrum. Good working order. Tel: Luton 54931.

EXCHANGE, Half set of golf clubs for 8K or 16K expansion for the Commodore Vic20. Tel: Congleton 77565.

DRAGON 32s required, £100+ awaits each sound machine, immediate delivery, I arrange collection/despatch. Details to A. Ellis, 25 Turners Road, St Austell, Cornwall, PL25 5NN.

DRAGON OWNERS to exchange programs. Tel: Leeds 687964.

New Software Marketing Company

setting up in Scotland requires original and inventive software for ZX81, Spectrum and BBC — other micros considered

Have you got an offer we can't refuse?

Call Ricky on
0382 88232

ASTROLOGY

truly AVAILABLE AT YOUR FINGERTIPS

USER PROMPTING PROGRAMS: merely key in birth information as requested by the computer — READ OUT (and/or PRINT OUT) what is normally the result of many hours of painstakingly tedious and complex mathematical calculations using tables, ephemeris, etc.

THE SIDERAL TIME OF BIRTH.
THE ASCENDANT AND MIDHEAVEN in Sign, Degrees, Minutes and Seconds for EQUAL HOUSE SYSTEM.
THE SIGNS AND POSITIONS OF THE HOUSE CUSPS in Sign, Degree, and Minutes for the PLACIDEAN SYSTEM.
THE SUN AND MOON POSITIONS in Sign, Degrees, Minutes and Seconds.
ALL THE PLANETS' POSITIONS in Sign, Degrees and Minutes.
THE LUNAR NODE — THE PART OF FORTUNE — THE VERTEX AND A HOST OF OTHER BIRTHCHART INFORMATION AT THE TOUCH OF A KEY.

ZX81 16K

ZODIAC I ONLY £10.00

ZODIAC II ONLY £8.00

GIVES YOU THE ASPECTS AND MIDPOINTS

FOR 48K SPECTRUM AND DRAGON 32

ZODIAC F

Full combined program on one cassette

FOR ONLY £15.00

Other programs in course of preparation include: PROGRESSING THE HOROSCOPE; RECTIFICATION OF THE BIRTH TIME, etc.

Send orders with cheque payable to:

STELLAR SERVICES

8 FIR TREE VALE, LEEDS LS17 7EY

Tel: (0532) 692770

TOWN NATHAN PRESENTS...

ASSASSIN SOFTWARE

- ★ YOU'VE INCINERATED INVADERS!
- ★ YOU'VE PERSPIRED OVER PACMAN!
- ★ YOU'VE CRUNCHED CRAZY KONG!

Stop all this senseless violence with...

★ "TOADS TRAVELS" ★

Help a Toad across the road, don't let the kids in the park squash him, mind the crocs and get him safely back to his lilly pads on the far bank of the river. This has to be the best "Frogger" yet for the 48K Spectrum...

ONLY £4.95 inc p&p

Available from both our Leeds Shops or mail order from:

ASSASSIN SOFTWARE

10 ASH ROAD

HEADINGLEY, LEEDS 6

★ Cheques and POs payable to Town Nathan

WATCH OUT FOR NEW TITLES COMING SOON

PROGRAMMERS — Assassin Software needs your marketable programs. Give us a call
Tel: (0532) 744 325

TWICKENHAM COMPUTER CENTRE LTD

ACORN

Commodore

Apple

Buy the **BEST BRITISH COMPUTER**

BBC Model A £299 BBC Model B £399

Wordwise Word Processor (needs 1.0 System)

Software — Acorn, Bytefile, Computer Concepts (logo 2)

Acornsoft on Disk

Joysticks for the BBC — 100K Single Disk Drives

BBC 800K Twin Disk Drives

Torch 800K Twin Disk Drives with CPU

Post & Packing extra

★ Commodore 64: £299

★ Coming soon: Acorn Electron — phone your order now!

Apple IIE G4K on special offer — phone for latest price

SPECIAL OFFERS

Whilst stocks last!

For the BBC:
Screen Layout Pad,
Flow Chart Pad &
Symbol Design Pad

Kit with ring binder
Rc. retail price £15.50
OUR PRICE ONLY
£12.50 incl VAT

Daisywheel Printer for BBC
Complete with Interfacer £425
Star 315 Dot Matrix Printer £425
Star 315 Dot Matrix Printer £550
Daisywheel Printer £550
Block & Write TV with Monitor conversion
12" £180 14" £70
Cassette Deck (BBC compatible): £30
Twin Pre-set Adapters: £195

Plus software, peripherals, games, books and much more always available from
Twickenham Computer Centre
72 Heath Rd Twickenham Middle TW1 4BW (01-892 7896/01-891 1612)

Nationwide
delivery
by Securair



NEW FROM ASN FOR THE COMMODORE 64 NECKED

AVAILABLE IN SIX LANGUAGES

Necked is based on the pen and paper game of Hangman but requires only one person to play it. The program has a dictionary of 200 words. The Foreign Language versions display the English words on Side 1 which you must translate. On Side 2 you must translate the words back into English.

AVAILABLE IN
ENGLISH, FRENCH, GERMAN, SPANISH, SWEDISH, ITALIAN

Price **£7.95** INC VAT Dealer Enquiries Welcome

Send to:

ASN COMPUTER SERVICES LTD

DEPT PCW, 89 STATION CRESCENT
ASHFORD, MIDDX TW15 3HN

★ Software Authors wanted. Top royalties paid for all popular micros

ANGLIA HOME COMPUTER BARGAINS

Dragon 32	@ £167.99	Vic20 pack	@ £137.99
Spectrum 48K	@ £127.99	Osborne D/D	@ £1,375.35
Commodore 64	@ £264.99	Epson HX-20	@ £425.45
Oric 48K	@ £158.99	Epson FX-80	@ £448.45
Lynx 48K	@ £218.99	Epson RX-80	@ £310.45

Price inc. VAT

Excess HP-85 stock at half price

Add £5 p&p Access and Barclaycard welcome

CALL Heather Ruffles
Anglia Home Computer Bargains
88a St Benedict's Street
Norwich, NR2 4AB

TEL: (0603) 667036/7 TELEX: 975201

NEW RELEASES

RIVAL SNAKE



Snake Pit was a popular, even cultish, game on the BBC micro. Now Postern has issued a version for the Spectrum.

The game involves moving around a maze eating snake eggs. This is made more difficult by the fact that a rival snake is also eating them, and is also releasing a number of other snakes by eating the eggs which are keeping them captive. Needless to say, if you touch any one of the snakes, the game is over.

In the unlikely event that you manage to clear the screen, you are rewarded with a chance to eat the other snakes and another screenful of eggs — and a faster speed, of course.

Program *Snake Pit*
Price £7.99
Micro Spectrum 16K
Supplier Postern
PO Box 2
Andoversford
Cheltenham
Glos GL54 5SW

OUTER SPACE

Federation Software is another company involved with the Ace. It has issued three cassettes, one for the 3K machine and the others for the expanded 19K version.

Spacehop involves an intrepid space traveller leaving his home world and journeying through space to another planet where he must collect a container before returning home.

It is not, of course, as simple as that. There are many

hazards to be overcome and good hand and eye coordination is required.

Program *Spacehop*
Price £6
Micro Ace
Supplier Federation Software
56 Rawley Crescent
New Doston
Northampton NN5 6PT

25 VARIETIES

QED systems is another company that has moved its operation from commercial systems to micro computers.

The company has just issued two cassettes for the Dragon. The *Variety Pack* contains 25 programs designed to educate and entertain the recent Dragon owner. Versions are also available for the Oric and the Spectrum.

Program *The Variety Pack*
Price £4.95
Micro Dragon 32
Supplier QED Systems
2 Sefton Gardens
Aughton
Nr Ormskirk
Lancs L39 6RZ

SEVEN-UP!

THE SOFT SEVEN

1. GALACTIC BOMBER
2. HEAR AND SPELL
3. WORDSEARCH
4. GRAPHIX
5. MUSIC MAKER
6. HANGMAN
7. THE GREAT RACE

DRAGON 32

T. D. Copsey

The *Soft Seven* is a games pack for the Dragon 32. The seven menu driven programs include versions of *Hangman* and *Bomber*, as well as educational games like *Music Maker* and *Wordsearch*.

TD Copsey is a new company which intends to specialise in programs for the Dragon.

Program *The Soft Seven*
Price £3.50

Micro *Dragon 32*
Supplier T D Copsey
20 Thorington Avenue
Daws Heath
Hadleigh
Benfleet
Essex

WAR GAMES

Impact Software has issued three new games. *Specman* is a version of *Pacman* for either of the Spectrum machines. Both the other games are for the Vic20.

Terminator is a machine code space battle game which will work on the unexpanded machine. There are 16 kinds of aliens with the addition of zagers and meteors at later levels.

Program *Terminator*
Price £6.50
Micro Vic20
Supplier Impact Software
70 Redford Avenue
Edinburgh EH13 0BW

BALANCED

Eargate Computers is a company catering for a range of machines in the field of "informational" software. The *Diet Analysis* program calculates your optimum calories intake and analyses your present diet.

Your dietary balance is derived from the list of foods you have eaten and their weight. The program allows you to compare your own food balance with that of the "ideal" for your height and degree of exercise.

It could be useful for computer buffs, who tend to spend all day sitting down peering at television screens.

Program *Diet Analysis Program*
Price £7.95

Micro Spectrum, New Brain and BBC

Supplier Eargate Computers
PO Box 24 Wokingham
Berkshire RG11 1PE

STOCK CONTROL

A full stock ledger system, comparable to those available on the Apple II or Pet, is provided by *Stock Accounting and Control*, claims Kemp.

The program will provide a monthly ledger account print-

out and will accept 15,000 entries a year. Provisions include the assigning of a four digit number to each record to prevent duplication of files.

If a file is to be deleted, the whole record will be deleted prior to deletion as a safety measure.

The program comes with an operators manual, which not only explains use of the program, but also offers advice on tape head cleaning and software maintenance.

Program *Stock Accounting and Control*
Price £14.95
Micro Spectrum 48K
Supplier Kemp Ltd
43 Muswell Hill
London N10 3PN

ROAD TEST



For some reason, nobody has issued a road race game for the Spectrum — until now. A strange situation, since one of the questions I am most often asked is "do you know of any car games for the Spectrum?"

I would guess, therefore, that Boss whose first game is entitled *Turbo Driver* should do quite well.

The game involves steering your car left and right past various hazards, which include manholes, sheep and a funeral procession. Every hazard you fail to dodge will cost you fuel and, if you are particularly unlucky, you may run out of fuel before you reach the finishing line.

Program *Turbo Driver*
Price £5.95
Micro Spectrum 16/48
Supplier Boss Flockton House
Audby Lane
Wetherby
West Yorkshire
LS22 4FD

NEW RELEASES

DESTROYED

Droids is a new machine code game for the Dragon 32 from J Morrison (Micros).

The object of the game is to prevent the *Droids* obliterating the earth, by removing lead shields and releasing trioxon bombs. The first few *Droids* can be destroyed fairly easily, but the last few will start firing at you.

As the game gets more difficult, the points awarded for each destroyed *Droid* increases.

Program *Droids*
Price £6.95
Micro Dragon 32
Supplier J Morrison (Micros)
2 Glensdale Street
Leeds LS9 9JJ

PRINT-OUT

Recent weeks have seen a rapid change in the amount of software available for Jupiter Ace owners. A number of companies have issued programs for the Forth machine.

Remsoft has nearly 20 titles available. These include the usual games packs and arcade

favourites like *Frogger*, as well as some useful utilities.

Tape 11 is a ZX Printer Driver. It uses 305 bytes to divert characters from the screen to the printer, enabling Ace owners to print out their programs on the cheap ZX printer.

The current version requires a simple Ace/ZX adaptor, but a program which requires no hardware at all is promised soon.

Program ZX Printer Driver
Price £5.50
Micro Ace
Supplier Remsoft Computer Software
18 George Street
Brighton BN2 1RH

STAR TREK

No prizes for guessing the identity of Silversoft's *Starship Enterprise*.

The 30K game has all the usual *Star Trek* features of long and short range scan, shields damage reports, etc.

However, a certain arcade element has been introduced. When you find the enemy ship, it appears on screen and you must use the cursors to aim your phasers.

The program also has a

Timegate-like graphic display when you warp through space.

Program *Starship Enterprise*
Price £5.95
Micro Spectrum 48K
Supplier Silversoft
2 Hammersmith
Broadway
London W6

STUNNING!



The new release from Imagine is called *Jumping Jack* and, true to the tradition of the company, it isn't really like any other game you could name.

You control a little stick man with a large nose whom you must guide to the top of the screen. This involves rising over a number of levels. Each level is moving and, worse still, some of them have gaps through which your man is likely to fall.

If your man does fall through a gap then he will be stunned for a few moments and lay on his back waving his legs in the air. This is likely to cause him to fall still further, since he is unable to run from other gaps in lower levels while he is still stunned.

As the game progresses it gets harder. Once you have completed the first screen, a number of hazards appear including an aeroplane, a bus, a hatchet and a man firing a shotgun.

Program *Jumping Jack*
Price £5.50
Micro Spectrum 16/48K
Supplier Imagine Software
Masons Buildings
Exchange Street East
Liverpool
Merseyside L2 3PN

WORD GAME

Perhaps because of its "serious" image, there are many more companies offering educational software for the BBC computer than there are for any other machine.

GTM is one such company and it specialises in educational "games".

Highflyer gives practice and tests on homophones — words which sound the same but are spelt differently. As children get the correct answers, an aeroplane will journey from London to Paris.

Program *Highflyer*
Price £9.95
Micro BBC
Supplier GTM Software
864 York Road
Leeds

GANG OF 12



A number of classic computer games are incorporated into the *Gang of 12* games pack from Loach Software.

Included are *Pacman*, *Pontoon*, *Centipede*, *Bomber* and *Kingdom*. All the games will work on both the 16 and 48K machines.

Program *Gang of 12*
Price £4
Micro Spectrum
Supplier Loach Software
8 Cottessford Close
Hadleigh Suffolk
IP7 5JA

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 19 Whitcomb Street, London WC2 7HF.



Aggurat



Two's company

To understand why there are numerical inaccuracies in micros — which produce such seeming senseless as the square of the square root of a value being different from the original value — we need to appreciate how numbers are treated by computers.

Most micros use binary arithmetic, whereas most calculators and some computers use binary-coded decimal (bcd). Start with bcd and consider the number 987. In bcd each of the three digits 9, 8 and 7 is stored exactly, taking up to four bits. In binary arithmetic 9 is 1001, 8 is 1000, and 7 is 0111 (see E P Northrop, *Riddles in Mathematics*, Penguin Books, for an amusing account) and, even though it is possible to use less than four bits for some binary numbers, we have to allow for the greatest number.

The basic blocks in memory, the bytes, are of eight bits. In each byte, therefore, there is room for two decimal figures, each occupying up to four bytes. To store the value 987, therefore, we need to use two bytes.

With a calculator or computer using bcd, we can use exact arithmetic and we do not have to convert the value 0.1 to its binary equivalent. Instead we can store it as 1 by the value of 10^{-1} . We still get approximations through rounding, but at least the number can be stored as an exact bcd number.

Now consider this: the value 255 stored as a bcd number is 0000 0010 0101 0101. But 255 stored as an ordinary binary number is 1111 1111. The bcd method of storing values is rather expensive in terms of space, compared to the binary method.

As a result, many microcomputers store

values as binary numbers rather than as bcd numbers to save space. (Not all micros use binary — the Jupiter Ace uses bcd for floating-point numbers. The Ace also rounds up, not down, and does not 'chop'.)

I will give a simple little routine to turn a decimal value into its binary equivalent, and I will store successive bits in a character array. It is not written for any particular computer, so it may need to be slightly modified to run.

```
10 DIM WORDS(15): REM 16 elements 0 to 15
20 INPUT "Value": X
30 FOR I = 0 TO 15
40 WORDS(I) = CHR$(48 + FNBIT(X))
50 X = FNBOY(X): NEXT I
60 FOR I = 15 TO 0 STEP -1
70 PRINT WORDS(I):
80 NEXT I: PRINT
1000 DEF FNBIT(X) = X - INT (X/2)
2000 DEF FNBOY(X) = INT(X/2)
```

The value is X, and we store in successive elements of the character array Words, a "1" if X is odd, or a "0" if even. FNBIT works out the bit value (ie, whether even or odd) and, in line 40, 48 is added on to the result of the function, which is turned into a character (by CHR\$). Line 50 merely halves the value of X (losing any decimal part), to give the new value of X its new body.

The answer given corresponds to two bytes (16 bits), sometimes called a word, and if a small value (eg, 3) is tried then the word is mostly leading zeros. This emulates sixteen-bit integer numbers.

Take this example: the binary equivalent of 65535, is 1111 1111 1111 1111. The result of `INT(65535/2)` is 32767 and the binary equivalent of 32767 is 0111 1111 1111 1111. So, to divide by 2 in binary arithmetic is to move all the bits one place to the right and introduce a leading 0 (to divide by 10 in decimal arithmetic we also drop off the last digit — 123410 is 123, with a remainder of 4).

Binary arithmetic on a computer usually involves dropping off the last bit, without remembering the value of the remainder and this is called *chopped arithmetic*.

Run the program and input — 1 as the value. The result is 1111 1111 1111 1111 — why? ■

Boris Allan

Puzzle

Number change!

At Greyfriars School, the upper-third maths class was taking a rest from Euclidean geometry. "Please Sir!" replied Jones minor, "If I could buy 2 for fifty pence, 50 for a pound and 100 for one pound-fifty, what would I be buying?"

"House numbers, costing fifty pence each," replied Sir, "I may be old, but I'm not that old. While we're on the subject — here's a similar problem for you! I have a supply of 'stick-on' printed numerals costing a half-penny each, with which I am going to number all the lockers in the gymnasium changing room — commencing with locker number '1' and continuing upwards in sequence. After I have done that I find that the number of the highest locker equals the cost, in pence, of the numerals used.

"And so, Jones minor, how many lockers were there?"

Solution to Puzzle No 56

The ground, pole and cobweb form a right-angled triangle.



Since the two paths to the mayfly are equal: $\text{height of pole} = 7 - H$. Since this is a right-angled triangle, using Pythagoras: $(\text{height})^2 + (H+1)^2 = c^2$. Combining the two equations to eliminate the height gives: $(7-H)^2 + (H+1)^2 = 36$.

This equation can now be solved using a computer program which tests values of H to see if they satisfy the above equation. X and 36 are both multiplied by 10 in line 30 to get the right accuracy with the `INT` command.

```
10 LET H=7
20 LET X = (7-H) * (7-H) + (H+1) * (H+1)
30 IF INT (X*10) = 360 THEN GOSUB 60
40 LET H = H-0.01
50 GOTO 20
60 PRINT "HEIGHT="; 7-H
70 RETURN
```

Using the program, there are two possible answers: 2.57 and 5.42.

This illustrates how inaccurate computers can be. An accurate pair of answers obtained using algebra gives: $4.2 = 2.5858$ or 5.4142.

Winner of Puzzle No 56

The winners are the doctors and nurses of Strood Health Centre, Strood, Kent, who receive £10.

Top 10 Top 10 Top 10 Top 10

Dragon

- (1) The King (Microdeal)
- (2) Space War (Microdeal)
- (3) Planet Invasion (Microdeal)
- (4) Katerspiller Attack (Microdeal)
- (5) Dragon Trek (Salamander)
- (6) Madness and the Minotaur (Dragon Data)
- (7) Grand Prix (Salamander)
- (8) Alcatraz 2 (Microdeal)
- (9) Chess (Dragon Data)
- (10) Basic Tutorial (Amptsoft)

(Figures compiled by Boots & Co. London)

Spectrum

- (1) Flight Simulation (Pison)
- (2) Jet Pac (Ultimate)
- (3) Penetrator (Melbourne House)
- (4) Transylvania Tower (Richard Shepherd)
- (5) The Hobbit (Melbourne House)
- (6) 3D Tank (DK Tronic)
- (7) Ah Diddums (Imagine)
- (8) Horace Goes Skiing (Pison Melbourne House)
- (9) Arcadia (Imagine)
- (10) Hungry Horace (Pison Melbourne House)

*Reuses 48K.
(Figures compiled by W H Smith & Son Ltd)

Atari

- (1) Zaxxon (Datasoft)
- (2) Helicat Ace (Microprose)†
- (3) Time Warp (English Software)
- (4) Escape from Perilous (English Software)
- (5) Chop Lifer (Broderbund)
- (6) Preppie 2 (Adventure International)
- (7) AE (Broderbund)
- (8) Castle Wolfenstein (Muse)
- (9) The Sands of Egypt (Datasoft)
- (10) Necromancer (Synapse)†

† cartridge, 132K cassette, 116K disc, 132K disc.
(Figures compiled by Calisto Computers, Birmingham 021-632 6498)

Vic20

- (1) Partic (Bug-Byte)
- (2) Wacky Walters (Imagine)
- (3) Arcadia (Imagine)
- (4) Comedy (Imagine)
- (5) Introduction to Basic Part 1 (Commodore)
- (6) Asteroids (Bug-Byte)
- (7) Amok (Audience)
- (8) Catcha Snatcha (Imagine)
- (9) Alien Blitz (Audience)
- (10) Introduction to Basic Part 2 (Commodore)

(Figures compiled by Boots & Co. London)

BBC

- (1) Word Wise (Computer Concepts)
- (2) Killer Gorilla (Program Form)
- (3) Great Britain Limited (Simon W Hesse)
- (4) Rocket Road (Acornsoft)
- (5) Meteos (Acornsoft)
- (6) Inheritance (Simon W Hesse)
- (7) Snapper (Acornsoft)
- (8) Graphs and Charts (Acornsoft)
- (9) Home Finance (BBC)
- (10) Chess (Computer Concepts)

Model B only except where shown. †Runs on Model A or B.
(Figures compiled by Micro Management, Ipswich 0473 59181)

ZX81

- (1) 3D Monster Maze (New Generation)
- (2) Flight Simulation (Pison)
- (3) Chess (Pison)
- (4) Q&S Scramble (Quickval)
- (5) Galaxians (Artic)
- (6) 777 Star Raiders (Pison)
- (7) Alien Dropout (Silversoft)
- (8) Avenger (Abacus)
- (9) 1010 Games for 102 (LK Grey†)
- (10) Catabolism (LK Grey)

*All 48K except where shown. †Runs in 1K.
(Figures compiled by W H Smith & Son Ltd)

Books

- (1) Vic Programmer's Reference Guide, Commodore (Commodore)
- (2) Spectrum Hardware Manual, Dickens (Melbourne House)
- (3) Commodore 64 Programmer's Reference Guide, Commodore (Commodore)
- (4) Assembly Language Programming for the BBC Micro, Bimbaum (Macmillan)
- (5) 6809 Assembly Language Programming, Leverthal (Osbourn)
- (6) Spectrum Rom Disassembly, Logan (Melbourne House)
- (7) The BBC Micro, An Expert Guide, James (Granada)
- (8) The Dragon, Carter (Melbourne House)
- (9) Machine-code for Beginners, Stephenson (News)
- (10) Dynamic Games for Your Dragon, Hamel (Interface)

(Figures compiled by Watford Technical Books, Watford 0923 23304)
(Last week's position in brackets)

PIMAN



TIMES

AUTOMATA IN HOAX TOP 10 SILLY ADVERT MISSPIN!

EXCLUSIVE SHOCK REPORT BY HUGH ANCHOR
The home computer world has been rocked today by the revelation that all so-called "TOP 10 CHARTS" are a massive hoax, perpetrated by the notorious AUTOMATA U.K. Acting on a supergrass tip-off, the C.I.B. (Computer Idiots Dpt.) backed by hooded members of the S.A.S. (Stuff Automata Software) made a dawn swoop on the national centre for all "Top Ten" research: namely, the Cash'n'Carry-Tundoori-Boutique-Garage-Video-Hairdressers. Fraud Squad detectives apprehended master-computer-racketeer... THE PIMAN, caught in the act of faking the honest, sacred and incriminating TOP TEN (see below). Other gang members were caught trying to bribe the country's chief software analyst, (the cleaner's nephew), by repeatedly applying a 16,000 gold and diamond sundial to the side of his head. Detective Sgt. A. Hitler commented, "I'm as sick as a parrot. Automonopoli is the greatest thing since the invasion of Poland. Don't point that thing at me sonny. Is this a clue, Nic. These adverts get sillier every week..."

(please turn to page 94)

OFFICIAL TOP 10

compiled by the cleaner's nephew at the Micro-Cash'n'Carry-Tundoori-Boutique-Garage-Video-Hairdressers. (honest) last week's positions totally made up.

- 1 (8) TORTURED DEEP-FRY BABIES (Phamily Phunn)
- 2 (1) STUFFA COPYRIGHT (Ripoff Software Ltd.)
- 3 (-) OLD PROGRAM NEW TITLE (Fastback)
- 4 (4) DORSEYFROGGERACTRONKINGINVASERS (Nitsunaki)
- 5 (105) FIN WITH V.A.T. (Yawnarama)
- 6 (69) KILLER HOOBIT MEETS EMANUELLE (See you in Court)
- 7 (-) DEAD CRUMMY ADVENTURE (Moronsoft Imitations)
- 8 (6) A DUFF CASSETTE (Bedsitter International)
- 9 (4) HORACE GOES WEE WEE (Pason)
- 10 (-) HERPIES INVASION (Whitehouse & Cohen)

AUTOMATA FAKE HORROR TOP 10

compiled by The Piman from Automata's order book. Last week's places in brackets.

- 1 (1) AUTOMONOPOLI - Spectrum 48K - £6 (we dare you to play against it)
- 2 (3) PIMANIA - Spectrum 48K - £10 (the best advert ever reviewed)
- 3 (5) PIMANIA - Dragon 32 - £10 (why should Spectrums have all the fun)
- 4 (-) THE BIBLE - ZX81 1K - £3 (slightly outrageous, no offence vicar)
- 5 (2) PIMANIA - BBC 32K - £10 (why should Dragons have all the fun)
- 6 (8) BEST POSSIBLE TASTE - ZX81 1K - £5 (thirty mad games for a fiver!)
- 7 (9) BUNNY plus ETAs - Spectrum 16K - £5 (2 happy games for the young at heart)
- 8 (4) PIMANIA - ZX81 1K - £5 (why should BBCs have all the fun)
- 9 (7) DOODLES AND DEMOS - Dragon 32 - £5 (a must for the graphic designer)
- 10 (6) CAN OF WORMS - ZX81 1K - £3 (why are you still buying this?)



(left to right: 'UNCLE' CLAIR SINCLIVE, the brains behind the conspiracy; THE PIMAN, gang leader; QUEENIE-PI, gangster's moll; A RED HERRING; LURCH, Automata's so-called Office Parrott; and NIKIE RAYGON, dangerous psychopathic hit-man)

STOP PRESS



AUTOMONOPOLI is a unique version of the classic board game, for up to 5 players INCLUDING YOUR SPECTRUM. Moving full-size board; state of play at the touch of a button; we dare you to play against your own machine, but REMARE it may well win!

STOP STOP PRESS: Piman Knited in Birthday Honours!

Latest Results:

PIMANIA latest: no one has won the 56,000 golden sundial yet. Pimania is now the longest-running best-seller in micros. Several thousand Pimaniacs can't be wrong... JOIN US TODAY oinkkurbblehblubbhghghghghgrrr.

DEAR AUTOMATA, DESPITE YOUR VERY SILLY ADVERTISING, I AM ORDERING THE FOLLOWING COMPUTER SOFTWARE FROM YOU.....

AUTOMONOPOLI (Spectrum 48K) @£6.00p	<input type="checkbox"/>	tick
PIMANIA (Spectrum 48K) @£10.00p	<input type="checkbox"/>	
PIMANIA (Dragon 32) @£10.00p	<input type="checkbox"/>	
PIMANIA (BBC Micro 32K) @£10.00p	<input type="checkbox"/>	
PIMANIA (ZX81 16K) @£5.00p	<input type="checkbox"/>	

I enclose the right money, TOTAL £ or please charge my ACCESS/EUROCARD/MASTER CARD.

CARD NUMBER

my signature.....

my name.....

my address.....

Post Code.....
send to: AUTOMATA U.K. LTD., 65 OSBORNE ROAD, PORTSMOUTH, HANTS., PO5 3LR, ENGLAND.

all prices include VAT, packing & postage within the U.K. please add 10% to total price for overseas orders. Trade enquiries are welcomed.

please leave blank:
DESPATCH NUMBER.....

